Welcome to DialogClassic Web(tm)

Dialog level 02.16.02D
Last logoff: 01jul03 16:40:35
Logon file405 02jul03 14:02:58

*** ANNOUNCEMENT ***

***

--File 654 - US published applications from March 15, 2001 to the present are now online. Please see HELP NEWS 654 for details.

***

--File 581 - The 2003 annual reload of Population Demographics is complete. Please see Help News581 for details.

***

--File 156 - The 2003 annual reload of ToxFile is complete. Please see HELP NEWS156 for details.

***

--File 990 - NewsRoom now contains February 2003 to current records. File 992 - NewsRoom 2003 archive has been newly created and contains records from January 2003. The oldest months's records roll out of File 990 and into File 992 on the first weekend of each month. To search all 2003 records BEGIN 990, 992, or B NEWS2003, a new OneSearch category.

***

--Connect Time joins DialUnits as pricing options on Dialog. See HELP CONNECT for in

***

***

--SourceOne patents are now delivered to your email inbox as PDF replacing TIFF delivery. See HELP SOURCE1 for more information.

***

--Important news for public and academic libraries. See HELP LIBRARY for more information.

***

--Important Notice to Freelance Authors--
See HELP FREELANCE for more information

***

NEW FILES RELEASED
***World News Connection (File 985)
***Dialog NewsRoom - 2003 Archive (File 992)
***TRADEMARKSCAN-Czech Republic (File 680)
***TRADEMARKSCAN-Hungary (File 681)
***TRADEMARKSCAN-Poland (File 682)

***

UPDATING RESUMED

***

RELOADED
***Population Demographics -(File 581)
***CLAIMS Citation (Files 220-222)

REMOVED

***

>>> Enter BEGIN HOMEBASE for Dialog Announcements <<<
>>> of new databases, price changes, etc. <<<

****

HILIGHT set on as ' '
>>>100 is not in the range between 1 and 50, original value 30 is used.
IGOR705 is set ON as an alias for 2,9,15,16,20,35,65,77,99,148,160,233,256,275,347,3

10,813.
IGORMEDIC is set ON as an alias for 5,34,42,43,73,74,129,130,149,155,442,444,455.
IGORINSUR is set ON as an alias for 169,625,637.
IGORBANK is set ON as an alias for 139,267,268,625,626.
IGORTRANS is set ON as an alias for 6,63,80,108,637.
IGORSHOPCOUPON is set ON as an alias for 47,570,635,PAPERSMJ,PAPERSEU.
IGORINVEN is set ON as an alias for 6,7,8,14,34,94,434.
IGORFUNDTRANS is set ON as an alias for 608.
*** * * * See HELP NEWS 225 for information on new search prefixes**
and display codes

*** ***

SYSTEM:HOME
Cost is in DialUnits
*** DIALOG HOMEBASE(SM) Main Menu ***

Information:
1. Announcements (new files, reloads, etc.)
2. Database, Rates, & Command Descriptions
3. Help in Choosing Databases for Your Topic
4. Customer Services (telephone assistance, training, seminars, etc.)
5. Product Descriptions

Connections:
6. DIALOG(R) Document Delivery
7. Data Star(R)

/H = Help /L = Logoff /NOMENU = Command Mode

Enter an option number to view information or to connect to an online service. Enter a BEGIN command plus a file number to search a database (e.g., B1 for ERIC).
?

B IGOR705
>>> 77 does not exist
>>>1 of the specified files is not available
02jul03 14:03:18 User268082 Session D21.1
$0.00 0.236 DialUnits FileHomeBase
$0.00 Estimated cost FileHomeBase
$0.07 INTERNET
$0.07 Estimated cost this search
$0.07 Estimated total session cost 0.236 DialUnits

SYSTEM:OS - DIALOG OneSearch
File 2:INSPEC 1969-2003/Jun W4
(c) 2003 Institution of Electrical Engineers
***File 2: Alert feature enhanced for multiple files, duplicates**
removal, customized scheduling. See HELP ALERT.
File 9:Business & Industry(R) Jul/1994-2003/Jul 01
(c) 2003 Resp. DB Svcs.
File 15:ABI/Inform(R) 1971-2003/Jul 02
(c) 2003 ProQuest Info&Learning
***File 15: Alert feature enhanced for multiple files, duplicate**
removal, customized scheduling. See HELP ALERT.
File 16:Gale Group PROMT(R) 1990-2003/Jul 02

(c) 2003 The Gale Group
***File 16: Alert feature enhanced for multiple files, duplicate removal, customized scheduling. See HELP ALERT.**
File 20:Dialog Global Reporter 1997-2003/Jul 02
(c) 2003 The Dialog Corp.
File 35:Dissertation Abs Online 1861-2003/Jun
(c) 2003 ProQuest Info&Learning
File 65:Inside Conferences 1993-2003/Jun W5
(c) 2003 BLDSC all rts. reserv.
File 99:Wilson Appl. Sci & Tech Abs 1983-2003/May
(c) 2003 The HW Wilson Co.
File 148:Gale Group Trade & Industry DB 1976-2003/Jun 30
(c)2003 The Gale Group
***File 148: Alert feature enhanced for multiple files, duplicate** removal, customized scheduling. See HELP ALERT.
File 160:Gale Group PROMT(R) 1972-1989
(c) 1999 The Gale Group
File 233:Internet & Personal Comp. Abs. 1981-2003/May
(c) 2003 Info. Today Inc.
File 256:SoftBase:Reviews,Companies&Prods. 82-2003/Jun
(c)2003 Info.Sources Inc
File 275:Gale Group Computer DB(TM) 1983-2003/Jul 01
(c) 2003 The Gale Group
File 347:JAPIO Oct 1976-2003/Feb(Updated 030603)
(c) 2003 JPO & JAPIO
***File 347: JAPIO data problems with year 2000 records are now fixed.** Alerts have been run. See HELP NEWS 347 for details.
File 348:EUROPEAN PATENTS 1978-2003/Jun W04
(c) 2003 European Patent Office
File 349:PCT FULLTEXT 1979-2002/UB=20030626,UT=20030619
(c) 2003 WIPO/Univentio
File 474:New York Times Abs 1969-2003/Jul 01
(c) 2003 The New York Times
File 475:Wall Street Journal Abs 1973-2003/Jul 01
(c) 2003 The New York Times
File 476:Financial Times Fulltext 1982-2003/Jul 02
(c) 2003 Financial Times Ltd
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
(c) 2002 The Gale Group
***File 583: This file is no longer updating as of 12-13-2002.**
File 610:Business Wire 1999-2003/Jul 02
(c) 2003 Business Wire.
***File 610: File 610 now contains data from 3/99 forward.** Archive data (1986-2/99) is available in File 810.
File 613:PR Newswire 1999-2003/Jul 02
(c) 2003 PR Newswire Association Inc
***File 613: File 613 now contains data from 5/99 forward.** Archive data (1987-4/99) is available in File 813.
File 621:Gale Group New Prod.Annou.(R) 1985-2003/Jun 30
(c) 2003 The Gale Group
File 624:McGraw-Hill Publications 1985-2003/Jul 01
(c) 2003 McGraw-Hill Co. Inc
***File 624: Homeland Security & Defense and 9 Platt energy journals added** Please see HELP NEWS624 for more
File 634:San Jose Mercury Jun 1985-2003/Jul 01
(c) 2003 San Jose Mercury News
File 636:Gale Group Newsletter DB(TM) 1987-2003/Jul 01
(c) 2003 The Gale Group
File 810:Business Wire 1986-1999/Feb 28
(c) 1999 Business Wire

File 813:PR Newswire 1987-1999/Apr 30


```
     Set  Items  Description
     ---  -----  -----------
?

S (TOLL (3N) CALL ) (S) (SHAR??? OR APPORTION???)
Processing
Processing
Processing
Processed  10 of  28 files ...
Processing
Processed  20 of  28 files ...
Completed processing all files
            781777  TOLL
           6181093  CALL
          14023992  SHAR???
             23588  APPORTION???
      S1      2290  (TOLL (3N) CALL ) (S) (SHAR??? OR APPORTION???)
?

S (SHARING OR APPORTIONING ) (10N) COST
Processed  20 of  28 files ...
Processing
Completed processing all files
            953052  SHARING
              5203  APPORTIONING
           9058085  COST
      S2     40768  (SHARING OR APPORTIONING ) (10N) COST
?

S S1 AND S2
              2290  S1
             40768  S2
      S3         8  S1 AND S2
?

S S1 AND S2
              2290  S1

T SR /TI,KWIC/1-8
>>>'/' not a valid keyword
?


Set     Items   Description
S1       2290   (TOLL (3N) CALL ) (S) (SHAR??? OR APPORTION???)
S2      40768   (SHARING OR APPORTIONING ) (10N) COST
S3          8   S1 AND S2
S4          8   S1 AND S2
?

T S4/TI,KWIC/1-8
```

4/TI,KWIC/1 **(Item 1 from file: 15)**
DIALOG(R)File 15:

Picking up the phone tab

...ABSTRACT: While the council has paid for both conference service and the 800 number to provide**toll** -free□call□ -in by members, the organization is looking forward to saving as much as 40% per hour in calling fees by **sharing** costs with members.
...TEXT: While the council has paid for both conference service and the 800 number to provide **toll**-free□call□ -in by members, the organization is looking forward to saving as much as 40 percent per hour in calling fees by **sharing** costs with members. IHCC will continue to pay for the□cost□of conferencing, while committee members' long distance bills will incur the time charges for the...

...DESCRIPTORS:**Cost** **sharing**

4/TI,KWIC/2 (Item 1 from file: 20)

Oneworld Systems Ships Landmark All-In-One Communications Server for Small and Medium Businesses

... OneWorld 5000 is half the price of what a collection of competitive, single-function solutions**cost** . Dynamic Port Allocation -- By dynamically **sharing** analog telephone lines among all fax, remote access, Internet routing and data communications traffic, fewer...

... OWLD. For more information, visit the company's website at http://www.oneworldsystems.com, or**call** **toll** -free in the United States at 877/697-2677. In Canada, please call 416/621...

4/TI,KWIC/3 (Item 1 from file: 148)

Incentive regulation and productive efficiency in the U.S. telecommunications industry.

... telecommunications industry (Davis and Rhodes 1990). The model estimated is
productive efficiency = f (price cap;**sharing**and cap;□sharing□ ; fiber; separation;**toll** **call** ; business lines; switch□share□ ; size; ownership; compensation; corporate costs; customer costs).
A description of the variables is given in...efficiency incentives further since firms do not have the wherewithal to retain the benefits from **cost**savings. In fact, Braeutigam and Panzar (1993) label the earnings **sharing**schemes as sliding-scale, rate-of-return regulation.
The implications of the estimates obtained for...

4/TI,KWIC/4 (Item 2 from file: 148)

Third annual 1990 directory of human resources services, products and suppliers. (directory)

... and
"gold" microphone products cover the
gamut in honoring your computer personnel or
guest speakers.**Call**us□toll□free.
Johnson Leisure Incentives, 4041 N. Main,
Racine, WI 53402; 414-631-2847;

800-558...80 of the most important articles on
pension fund investments, federal
regulations, pension and profit**sharing**issues,
ESOPs, healthcare**cost**containment, and other
human resource issues.
Personnel Department Store, Borgman
Associates, 321 Lennon Lane, Walnut...301, 245 Rt. 22 West,
Bridgewater, NJ 08807; 201-218-0200;
201-218-9126
Contact:**Sharon**Kopcienski
City Federal Savings Bank,

4/TI,KWIC/5 (Item 1 from file: 275)
DIALOG(R)File 275:(c) 2003 The Gale Group. All rts. reserv.

PBX buyers' guide: Teleconnect's annual roundup of switch makers' finest systems.

... equipped with a powerful arsenal of useful capabilities. DSS, flash over trunk, group pickup, line**sharing** , least□cost□routing, internal/external paging,**toll**restriction and a□call□accounting system constitute a mere K-ration in the System one feature-rich storehouse. The ...

4/TI,KWIC/6 (Item 1 from file: 349)
DIALOG(R)File 349:(c) 2003 WIPO/Univentio. All rts. reserv.

DYNAMIC SPLIT BILLING OF TELEPHONE CALLS
TAXATION DYNAMIQUE DIVISEE D'APPELS TELEPHONIQUES

Fulltext Availability:
Detailed Description

Detailed Description
... the period cost associated with at least one of the indivisible time periods of a**toll call**is assigned to both the terminating and originating subscribers. The apportionment of the basic cost of a call is automatically authorized according to a predetermined agreement as to the**sharing**of each of the call's period costs. An authorization signal is required in order for **cost sharing**to occur. In one embodiment, the authorization signal -is automatically generated, if the originating subscriber...

...This prior art system does not provide a subscriber with the capability to define a**cost sharing**arrangement after the call has been connected. In addition, this system only provides**cost sharing** when the subscriber that would not normally be charged for the call is the terminating...

...a toll-free number is provided to a customer to access a provider in a**toll** -free□call□from an originating customer telephone number. The originating customer telephone number is received in response to the **toll** -free□call□ . The□toll□ -free□call□is converted to a billable call during or after the**toll** -free□call□and the billable call is

billed to the originating
customer telephone number. This method provides...

...monetary amounts
charged to the customer depend on the items purchased, not on the actual**cost**of the telephone call. It does not provide□cost sharing□ of the**cost**of the telephone call.

It is desirable to provide the capability to define an arrangement for**sharing**the□cost□of a telephone call after the call has been connected.
Likewise, it is desirable to provide**cost sharing**capability to the subscriber that would not normally be charged for the call, regardless of ...

...a
telephone call which provides a subscriber with the capability to define an arrangement for**sharing**the□cost□of a telephone call after the call has been connected. It provides**cost sharing**capability to the subscriber that
party is the originating subscriber or the terminating subscriber
A...

4/TI,KWIC/7 (Item 1 from file: 613)
DIALOG(R)File 613:

Imation Announces New Business Select Optical Media

...DVDs are ideal for high-capacity
applications, such as PC and network backups, archiving, file**sharing**and duplication. These**cost** -effective discs have a high-quality gold surface that
presents the digital content in a...

...in the second half of 2003. For more
information, visit www.imation.com/businessselect , or**call**Imation's **toll** -
free Business Select customer information line at 1-866-312-7787.

Fifty Years of Manufacturing...

4/TI,KWIC/8 (Item 2 from file: 613)
DIALOG(R)File 613:

Schweiker Administration Expansion of Long-Term Care Services

TEXT:
...of a new "Bridge" Program. A
new aspect for these programs is the introduction of**cost sharing**for some
individuals. **Cost sharing**allows more people to receive community services,
and is structured to require only those who...

...one-time investment of $10 million in
tobacco funding and the implementation of a statewide**cost** -□sharing□ program.
Consumers whose income exceeds 125 percent of poverty (currently $895 a

month
after allowable deductions), will be asked to**share**in the cost of several
long-term care services on an income-related sliding scale...

...constraints," Secretary Browdie said.
"Seniors and aging service professionals have been recommending a standardized
statewide**cost** -□sharing□system for a number of years. Half the Area Agencies
on Aging in the state had their own systems."
Secretary Houstoun said, "Through the use of consumer**cost** -□sharing□ , those
who can will be asked to contribute a small portion of the cost of...

...long-term care
website at www.state.pa.us, PA Keyword: "Long Term Care" -- and**call**a
toll -free helpline at 1-866-286-3636, which offer options, advice and answers.
The new...
?

Set	Items	Description
S1	2290	(TOLL (3N) CALL) (S) (SHAR??? OR APPORTION???)
S2	40768	(SHARING OR APPORTIONING) (10N) COST
S3	8	S1 AND S2
S4	8	S1 AND S2

?

T S4/9/1

4/9/1 (Item 1 from file: 15)
DIALOG(R)File 15:ABI/Inform(R)

01808106 04-59097
Picking up the phone tab
Kulczycki, Michael
Association Management v51n4 PP: 103 Apr 1999 ISSN: 0004-5578
JRNL CODE: AMG
DOC TYPE: Journal article LANGUAGE: English LENGTH: 1 Pages
WORD COUNT: 191

ABSTRACT: The Illinois Home Care Council has budgeted a significant amount annually to provide conference call capabilities for committee meetings, in lieu of in person meetings. While the council has paid for both conference service and the 800 number to provide**toll** -free□call□ -in by members, the organization is looking forward to saving as much as 40% per hour in calling fees by **sharing** costs with members.

TEXT: Consider sharing costs of conference calls with committee members who participate in them. That's the plan of the Illinois Home Care Council, Chicago. IHCC has budgeted a significant amount annually to provide conference call capabilities for committee meetings, in lieu of inperson meetings. While the council has paid for both conference service and the 800 number to provide**toll** -free□call□ -in by members, the organization is looking forward to saving as much as 40 percent per hour in calling fees by **sharing** costs with members. IHCC will continue to pay for the□cost□of conferencing, while committee members' long distance bills will incur the

time charges for the teleconference. With two thirds of IHCC's 12 standing committees using conference calls, which total 35-45 annually, the charges are significant.

While this issue can be member-sensitive, it is worth considering for your association. IHCC will continue to pay the price for its three government policy committees, because of the total volunteer time involved and because the member input-for advocacy, for example-is critical.

-Submitted by Michael Kulczycki, CAE, executive director, Illinois Home Care Council, Chicago, (staff size: 6, annual operating budget: $750,000). E-mail: mtkihcc@aol. com.

THIS IS THE FULL-TEXT.
GEOGRAPHIC NAMES: US

DESCRIPTORS: Associations; Member services; Teleconferencing; **Cost sharing**
CLASSIFICATION CODES: 9190 (CN=United States); 9000 (CN=Short Article); 9540 (CN=Nonprofit institutions)
?

T S4/9/3

4/9/3 (Item 1 from file: 148)
DIALOG(R)File 148:Gale Group Trade & Industry DB

11579941 SUPPLIER NUMBER: 20251608 (THIS IS THE FULL TEXT)
Incentive regulation and productive efficiency in the U.S. telecommunications industry.
Majumdar, Sumit K.
Journal of Business, v70, n4, p547(30)
Oct, 1997
ISSN: 0021-9398 LANGUAGE: English RECORD TYPE: Fulltext
WORD COUNT: 13091 LINE COUNT: 01068

TEXT:

1. Introduction

In the U.S. telecommunications industry a policy that influences the performance of firms is the nature of price regulation in place. For decades the mode of price regulation has been rate-of-return-based, or cost-plus in nature. Ever since the seminal analysis by Averch and Johnson (1962),(1) such a regulatory scheme has come in for continuing criticism by policymakers and academics (Kahn 1988); nevertheless, rate-of-return-based regulation still continues to be the common practice in many state-level regulatory jurisdictions.

In many other state-level regulatory jurisdictions, however, a major policy change that has taken place is the introduction of incentive regulation. For many local exchange companies in the U.S. telecommunications industry the regulatory regime now facing them is one where there is a cap on prices. Other than a pure price-caps scheme, incentive regulation schemes have included situations where, along with a price-caps scheme, there is a limit on the rate of return that a firm may retain. In other words, earnings over a particular limit have to be shared with regulatory authorities who may then redistribute these amounts back to consumers. Additionally, a number of state-level regulatory jurisdictions have implemented only an earnings sharing scheme as an alternative to rate of return regulation.

An explicit objective behind this policy change, the introduction of incentive regulation, has been to bring about improvements in productive efficiency (Federal Communications Commission (FCC) 1992; Braeutigam and Panzar 1993). Yet, in spite of the importance of the local operating sector to the telecommunications industry as a whole, a question requiring empirical scrutiny is, Has the introduction of incentive regulation had an effect on the economic performance of local exchange companies in the U.S. telecommunications industry? Taking advantage of the regulatory variation that exists in the United States, where there are over 50 regulatory bodies implementing a variety of policies that affect the behavior of over 50 large telecommunications carriers, this study assesses the effect of the introduction of incentive regulation on the performance of local exchange carriers in the U.S. telecommunications industry. Measuring performance as productive efficiency, using a nonparametric efficiency assessment technique that generates firm-specific parameters of productive efficiency, detailed evidence on the role that price-cap schemes play in explaining variations in such productive efficiency at the level of the local exchange companies is generated.

Specifically, in this study the cross-sectional and time-wise variations in the estimated parameters of productive efficiency are related to the differences in the regulatory environment that these firms face, and the study is unusual in isolating the contribution of firm-specific regulatory characteristics to firm-level performance parameters. The principal findings of the analysis are that, while the introduction of a pure price-cap scheme has a positive effect on productive efficiency, the introduction of an earnings-sharing scheme alone eventually has a detrimental effect on productive efficiency. Conversely, where a price-caps scheme is mixed with an earnings-sharing scheme a positive effect on productive efficiency is also felt, but this effect is of a smaller magnitude than the effect of a pure price-caps scheme alone. These results highlight the effectiveness of alternative regulatory schemes in the U.S. telecommunications industry and point to the relative merits of a price-caps scheme, when used alone, in enhancing regulated firms' performance.

This article unfolds as follows: in the next section the characteristics of incentive regulation schemes are discussed; the following section contains details of the empirical analysis carried out; thereafter, the results obtained are discussed, and the final section concludes the article.

II. Incentive Regulation in Theory and Practice

The sources of misgivings with rate-of-return regulation arise for several reasons. X-inefficiencies are perpetrated. It is intuitive that, if a firm is allowed to charge a price that will cover all its costs, the firm has little incentive either to reduce costs or to look for innovative ways of reducing such costs. The firm does not, in any way, suffer from being x-inefficient, and x-inefficiencies are passed on to customers. The Averch-Johnson (A-J) analysis has, in addition, shown that if a firm is allowed to earn a rate-of-return in excess of its cost of capital it will have an incentive to use too much capital and too little of other inputs. The outcome is higher costs per unit than if the most efficient combination of inputs were to be used.(2)

Incentive regulation schemes are policy innovations that attempt to resolve problems associated with rate-of-return regulation schemes and were introduced in the United Kingdom to regulate British Telecom following the Littlechild (1983) report. Price caps represent a contract between a firm and the regulator in which a price ceiling is set for a definite period of time, and, subject to that ceiling, firms are able to price at whatever levels are feasible. Given set price ceilings, firms are free to retain the surpluses that they earn as a result of attaining cost efficiencies and are also induced to make the necessary investments that may permit such

efficiencies to be gained. Thus, price-cap (price-minus) regulatory schemes help reverse many of the negative properties of rate-of-return (cost-plus) regulation.

In the U.S. telecommunications industry a two-tiered regulatory system exists. At the federal level the regulator is the FCC, and at the level of the various states and the District of Columbia public utility commissions regulate utilities. Price-cap plans began to be developed in the late 1980s (FCC 1987), and since 1991 AT&T's service offerings with respect to interstate long-distance calls have been regulated by the FCC under a FCC price-cap scheme, while many state-level regulatory bodies have, in many cases earlier than FCC, introduced incentive regulation in respect of the intrastate but inter-LATA (local access and transport area) services that AT&T provides.

In the United States, local operating companies are an important constituent of the industry.(3) Since 1987, when Nebraska -- along with deregulating the telecommunications industry in the state almost fully -- introduced price-cap regulation, a number of state utility commissions have introduced various forms of incentive regulation of local exchange carriers, at differing moments in time after 1987. As a result, there is both cross-sectional variation between states in the nature of regulatory regimes that influence local operating companies, as well as time- series variation as the regulatory regime evolves within a particular state.

A principal difference between federal- and local-level incentive regulation is that the local level rate-of-return constraints continue to operate in conjunction with price-cap schemes (Braeutigam and Panzar 1993). In a pure price-cap plan, the actual earnings of the firm do not affect future prices; with a price-cap plan coupled with an earnings-sharing scheme, provisions exist for adjusting prices if the firm's earnings fall outside a certain range. There is no generic sharing plan, per se, but a common form of earnings sharing is one in which the telephone company retains all earnings allowing a specified level of return retains half of all subsequent additional earnings permitting the company to earn, say, an additional percentage rate of return, and then refunds earnings above that level (Braeutigam and Panzar 1993). In addition, a number of states have implemented schemes where there in only an earnings-sharing scheme but no price-cap plan in effect. This type of a regulatory regime is similar to a rate-of-return-based regime, with a major difference being the institutionalization of the ad hoc process of rate reviews (Greenstein, McMaster, and Spiller 1995).(4)

Two published studies have empirically examined the effect of incentive regulation. Using data for 1983 and 1987 and a dummy variable to capture the existence of price-cap regulation, Mathios and Rogers (1989) examine variations in the way different states regulate AT&T's long-distance rates. They find that incentive regulation does lead to lower long-distance prices. Greenstein et al. (1995) use data for the period 1986 to 1991 and examine the effect of cross-sectional and time-series variations in state-level incentive regulation on telecommunications firms' investment decisions. They find that price- cap schemes do influence the level of deployment of cost-reducing technologies by local exchange companies. However, no studies as yet have examined whether the introduction of incentive regulation schemes has affected firms' productive efficiency.

III. Empirical Analysis

A. Aspects of the Analysis

To evaluate the effect on productive efficiency of a change from rate-of-return to incentive regulation, the study uses firm-level data for the years 1988-93 for a balanced panel of 45 local operating companies obtained from the FCC's annual Statistics of Communications Common Carriers. These data are collated by the FCC based on periodic reports submitted by the companies and published annually. The companies evaluated

accounts for 99% of all installed telephone lines in the United States. The data in respect of these companies are contemporary and contain detailed information in respect of several firm-specific factors. The time period, 1988-93, is also one during which the introduction of state-level incentive regulation schemes commenced. In that period a number of states have moved from rate-of-return to incentive regulation. Such policy changes have taken place at various points during the 6-year-period. Thus, there is both cross-sectional as well as time-wise variation in respect of the regulatory regimes that the local operating companies face.

Inefficiencies within firms' operations can arise in several ways. First, the mix between different types of inputs required can be out of line with industry technical norms. In fact, a criticism of rate-of- return regulation has been the inducing of unnecessary and non-cost-reducing capital investments. Second, excess payments to factors of production can be made, or firms can be allocatively inefficient. Third, given input mixes and factor prices, firms may not utilize their available resources in the most cost-effective manner. In other words, firms can be x-inefficient, and the perpetration of x-inefficiencies is a major criticism of rate-of-return regulation (FCC 1992; Braeutigam and Panzar 1993). This evaluation of the telecommunications firms is specifically concerned with whether, given input mixes and factor payments, the introduction of incentive regulation induces firms to be x-efficient in resource utilization relative to the firms that still face a rate-of- return regime in their regulatory environments.

Additionally, the study is limited by a very short time series. The analysis is static, and the technique applied to evaluate efficiency generates results that are driven by the data. Therefore, prognostications as to the future patterns of dynamic efficiency in an industry where capital is long-lived cannot be made. Telephone companies normally design networks to handle long-term future demand. Quite often the new-technology-based plant and equipment, while being dynamically efficient, may not be put to operational use because the existing old-technology-based plant and equipment are reaching peak optimal operating capacities. Thus, even if the introduction of incentive regulation induces investment in new cost-reducing technologies, such investments can have cost or x-inefficiency-reducing influences that are not felt in the short term. In fact, short-term declines in efficiency may possibly be noticed because of adjustment costs. Fiber optics deployment is a case in point. Fiber optics helps to reduce cost, yet much of the fiber optics capacity remains unused because the older copper wires still have considerable life and capacity. Whether the introduction of fiber optics positively affects firm-level short-term productive efficiency is an issue to be empirically resolved.

Approach. Prior research (Majumdar 1995) has used similar but older FCC data and analysis procedures to evaluate efficiency. A similar approach is followed in the present study. First, the relative productive efficiency of firms is determined using data envelopment analysis (DEA). It is a procedure useful for disaggregated firm-level analysis. Thereafter, two types of output generated by the DEA algorithms, capturing the technical and scale efficiency of firms, are used as the dependent variables in a model where the key explanatory variables capture the differences in regulatory regimes each operating company faces. A set of variables that also help explain variations in efficiency are included as controls. This particular micro-level approach helps to avoid an aggregation problem characterizing studies of the telecommunications industry (Davis and Rhodes 1990). The model estimated is

productive efficiency = f (price cap; **sharing**and cap;□sharing□ ; fiber; separation;**toll call** ; business lines; switch□share□ ; size; ownership; compensation; corporate costs; customer costs).

A description of the variables is given in the appendix.

B. Estimating Productive Efficiency

The log of the productive efficiency measures, estimated for each of the 45 local operating companies for each of the years 1988-93 using DEA, are the dependent variables in the model. Charnes, Cooper, and Rhodes (1978) (CCR) develop, while Banker, Charnes, and Cooper (1984) (BCC) and Charnes, Cooper, Golany, Seiford, and Stutz (1985) (CCGSS) extend, an approach to efficiency measurement first suggested by Farrell (1957), using a fractional program in which the ratio of the weighted outputs to weighted inputs of each observation in the data set is maximized.(5)

For each observation a single statistic, ranging between zero and one, is calculated. This is a measure of how efficient each observation is in converting a set of multiple inputs jointly and simultaneously into a set of multiple outputs. Using only observed output and input data, and without making assumptions as to the nature of technology or functional form, the DEA algorithm calculates an ex post measure of efficiency. This is accomplished by constructing an empirically based frontier and evaluating each observation against others included in the data set. Within the DEA framework two estimation approaches are feasible. First, it may be assumed that firms conserve inputs; then the DEA algorithm evaluates minimal use of inputs, with generated outputs kept constant. Second, it may be assumed that each firm augments outputs; given a finite stock of inputs available, firms seek to maximize outputs that can be generated with these.

Each observation rated as efficient is used to define an efficiency frontier, and firms not so rated are evaluated by comparison with a firm on the frontier, with broadly similar output or input mixes as the firm being compared. Thus, data from efficient firms are used to create a frontier based on the principle of envelopment. The efficiency measure gives an indication of how well each firm performs relative to its potential and to other firms. The best firms score one, on a scale of zero to one, and for the other firms the difference in score gives an idea of the x-inefficiencies that are present (Majumdar 1995).

The advantage of DEA also lies in its approach. Data envelopment analysis optimizes for each observation, in place of the overall aggregation and single optimization performed in statistical regressions. Instead of trying to fit a regression plane through the center of the data, DEA floats a piece-wise linear surface to rest on top of observations. This is empirically driven by the data, rather than by assumptions as to technology or functional forms. The only assumptions made are that of piece-wise linearity and convexity of the envelopment surface, and the DEA algorithms also take each observation's idiosyncrasies into account in the computation of relative efficiency score, unlike in regression-based estimation techniques where efficiency parameters are calculated based on an averaging process (Seiford and Thrall 1990).

1. Analytical Details of DEA

Data envelopment analysis is a linear-programming-based technique that converts to multiple input and output measures into a single measure of relative performance for each observation in a data set. The ratio of the weighted outputs to weighted inputs of each observation is maximized. This is the objective function. This ratio is a measure of performance as to how efficient each observation is in converting a set of inputs jointly and simultaneously into a set of outputs. Data required for computational purposes are an output vector (Y.sub.r) = (Y.sub.1j), (Y.sub.2j), ...,(Y.sub.rj)), outputs r = (1, 2, ...,R), for observations j = (1, 2, ...,k, ...,N) and an input vector (X.sub.i) = ((X.sub.1i), (X.sub.2i), ...,(X.sub.ij)), of inputs i = (1, 2 ...,I), for each of the j observations.

The general DEA model is presented by the following formulation:

(1) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

subject to the constraints:

(2) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

(3) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

and

(4) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

where

1. (e.sub.k,k) is the ratio measure of performance of how efficient each kth firm-level observation is with regard to jointly and simultaneously converting a set of multiple inputs (X.sub.i) into a set of multiple outputs (Y.sub.r); this is the objective function that is to be maximized;

2. k is the index for the observation specifically being assessed or evaluated;

3. j = 1, 2, ..., k, ...,N is the index for all the firm-year observations in the data set;

4. (e.sub.j,k) is the relative efficiency of observation j, when observation k is evaluated;

5. the j observations produce r outputs; r = 1, ...,R is the index for the outputs;

6. the j observations consume i inputs; i = 1, ...,I is the index for the resource inputs;

7. (U.sub.r,k), (V.sub.i,k) are the output and input weights associated with the evaluation of observation k; and

8. (epsilon) is a very small positive nonzero quantity.

The optimization in formulation (1) is repeated N times, once for each observation in the data set for which efficiency is to be evaluated; thus a separate evaluation of efficiency is carried out for each kth firmlevel observation. Each time the optimization is carried out, data for all j observations form part of the constraint set, so that the observation is compared against all others in the data set; the constraint in (2) implies that the efficiency of any other observation in the constraint set cannot be greater than one. Constraints (3) and (4) imply that there cannot be any negative inputs and outputs. The objective function values obtained partition the data set into two parts: one part consisting of efficient observations that determine an envelopment surface or frontier; the other part consisting of firms which are inefficient and for which (e.sub.k,k) (is less than) 1.

The weights, (U.sub.r,k) and (V.sub.i,k) in definition 7 are determined each time the optimization in (1) is carried out. Based on the data, the DEA procedure takes each observation's idiosyncracies into account in evaluating efficiency; the computation of weights is based on a determination of which input(s) a particular observation is adept in utilizing or which output(s) it is adept in generating. By assigning high weights to the input and output variables an observation is adept in utilizing or generating, and low weights to the others, the algorithm maximizes the observed performance of each observation in light of its particular capabilities. Defining

(5) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

yields the CCR model, which is the original DEA model.

Banker et al. (1984) show that the efficiency score generated by the CCR model is a composite total efficiency score that can be broken up, using the BCC algorithm, into two components: one capturing scale efficiency, which is the ability of each observation to operate as close to its most productive scale size as possible, and the other capturing pure technical or resource-conversion efficiency. To isolate pure technical efficiency, the BCC algorithm assumes that variable returns to scale exist for firms, and a variable (u.sub.0) is added in the programming formulation so that the hyperplanes for each observation do not pass through the origin, unlike in the CCR model, where hyperplanes pass through the origin because constant returns to scale are assumed. In the constraint set for the linear programming model, this variable is kept unconstrained so that it can take on values, depending on the data, which are negative (denoting

increasing returns to scale may exist), 0 (denoting constant returns to scale may exist) or positive (denoting decreasing returns to scale may exist) for each jth observation. Therefore, defining the relative efficiency measure as

(6) (MATHEMATICAL EXPRESSION NOT REPRODUCIBLE IN ASCII)

where (u.sub.0) is the unconstrained decision variable, yields the BCC model.

The CCR model generates a total efficiency score, while the BCC model generates a technical efficiency score. The BCC score captures firms' skills in resource conversion and is useful for assessing the x-inefficiencies. Dividing the CCR score by the BCC score generates a measure of scale efficiency for each observation. Scale efficiency measures the extent to which firms deviate from their most productive scale size, though firms may be either enjoying increasing returns or suffering from decreasing returns while being scale inefficient. Scale inefficiency is a measure of the divergence between present scale of operations and the most productive scale size attainable by individual firms.

2. Key Features of DEA

A number of features of DEA provide advantages for empirical research, but there are also limiting conditions to be taken into account. These are:

Dealing with multiple outputs and inputs. Data envelopment analysis handles multiple outputs and inputs simultaneously and deals with the use of joint inputs to produce joint outputs. In contrast, regression-based techniques handle only single-output estimation.

Functional from assumptions. No assumptions about the functional from other than convexity and piece-wise linearity are made. This property is useful for contemporary firm-level empirical analysis since functional relations between various inputs and outputs are difficult to define.

Nature of underlying technology. Data envelopment analysis makes no assumptions as to the technology used by firms. To assess how technological characteristics affect firms' resource utilization, in a second-stage analysis a variable capturing the nature of technology has to be factored in as a regressor in a model where the dependent variable is the DEA efficiency measure.

Fixed versus variable coefficients. The DEA algorithms generate coefficients that vary by firms, given the contemporary assumption of a heterogeneous variable coefficients resource-conversion process, because, in spite of two firms even having exactly the same inputs and blueprints as to the process involved, the end result observed is likely to be dissimilar.

Extremal methodology. Data envelopment analysis is a methodology oriented to frontiers estimation rather than estimation of central tendencies. It optimizes for each individual observation. Regression approaches are averaging techniques that proceed via a single optimization to arrive at a single parameter across all observations.

Sensitivity. The use of DEA is limited by the quality of the data used. Since DEA is an extremal methodology, any outliers in the data supplied to generate the frontier can bias the results.

Selection of inputs and outputs. Depending on the level of detail for inputs and outputs used in the computations, different firms may be efficient on different dimensions of input use; therefore, inputs and outputs data have to be carefully selected based on practical considerations and have to be consistently measured for all the evaluated observations. However, a variety of firms' resources can be used as inputs.

Applicability of results. Data envelopment analysis results are applicable with respect to the firms for which data have been used in generating the results. Also, the frontier firms identified based on the analysis of one data set may not necessarily be operating at the theoretically attainable frontier.

Data set design. Data set design decides whether the analysis is

static or dynamic. All N observations can be taken for a particular year; thus, optimization for the kth firm is done with respect to its cohorts for that year only. Information on firms for several years can be amalgamated to form a panel data set.

3. DEA Models Estimated

Using data for the 45 local operating companies for the years 1988-93, I deploy the BCC and CCR input-conserving algorithms to calculate efficiency scores. These scores are used to generate the dependent variables for the regression models estimated. Three outputs -- local calls, inter-LATA toll calls, and intra-LATA toll calls -- and three inputs -- number of switches, number of lines, and number of employees -- are used in the computations. The choice of these variables is consistent with the technical literature on the telecommunications industry (Skoog 1980; Egan 1991; Green 1992).

The use of switches, lines, and employees as inputs captures the empirical realities of modern telecommunications operations.(6)In a stylized model of a telecommunications network, switches provide the impetus behind the transmission of messages through the network, while the actual distribution medium for these messages is the lines. Therefore, lines are an input in the production and distribution of calls. There can be alternate strategies to use the firms' inputs. With the advent of electronic switching, resources have become fungible, and choices can be made to use technological capital such as lines or switches versus human capital. For example, electronic switches carry out housekeeping tasks done manually before. A local operating company can assign staff to develop switching programs rather than for record-keeping of the use of switches. Codes incorporated within switches can perform routine accounting, administrative, and record-keeping functions.

Between switches and lines there are possibilities for alternate use strategies. The deployment of fiber-optic cables, in conjunction with the use of electronic switching, means that a number of system-management tasks handled by expensive switches can be taken over by lines with software codes incorporated within them at specified points. These lines function as miniswitches for handling basic line allocation and calling functions (Green 1992). The use of such lines reduces the use of switches for basic calling and enables the switches to be used for providing value-added services. To the extent that incentive regulation schemes allow firms to retain cost savings that they generate, the introduction of these schemes can also bring about changes in the operational processes within the firms with respect to how resources are deployed and intrafirm activities coordinated. Changes in basic operational processes can have a long-term effect on future patterns of performance within the industry.

C. Explaining Variations in Productive Efficiency

1. Regulatory Effects

While a number of aggregate state-level classifications of regulatory regimes in the United States exist, the Greenstein et al. (1995) documentation of the regulatory conditions faced by each individual firm is used for the current analysis. Within a state two operating companies need not face the same set of institutional rules; for example, in Michigan different regulatory schemes may exist for GTE Midwest and Michigan Bell. Hence, the information on firm-specific regulatory regimes is useful in joining up with the firm-specific FCC information available. Thereby, the specific effects of incentive regulation regimes faced by firms on productive efficiency can be isolated. The variable PRICE CAP takes on the value of one if the state in which a firm operates has implemented pure price-cap regulation in the various years that are studied, and zero otherwise. Between 1987 and 1993 many states, for example, Kansas, Maine, Nebraska, and Wisconsin, have implemented such a regulatory scheme.

There are several multistate operating companies in the United States, for example, GTE Northwest. For such companies a PRICE CAP index is

constructed. Each state in which such a company operates can be identified as one that has either implemented or not implemented a pure price-cap scheme during the years studied. An index of exposure to pure price-cap regulation is derived by weighting positive state dummies by the proportion of lines that each state contributes to the total telephone lines operated by the operating company. Data on the number of lines operated by each company are available from a periodic FCC Monitoring Report (FCC 1993) and is the most direct measure of the extent of each operating company's activities in any particular state.

Price-cap schemes can also have a price-freeze component, which reduces the abilities of companies to price flexibly (Greenstein et al. 1995). Under a price freeze companies cannot necessarily reduce prices, but they do face a price ceiling as they would anyway when faced with a flexible pricing regime. Since a price-cap regime induces behavioral changes in firms as a result of the price ceiling being enforced, and is a price-minus regime in practical terms, the behavioral consequences of frozen versus flexible prices in a price-cap regime are likely to be similar with respect to inducing operational efficiencies.

A number of states operate an earnings-sharing system in consonance with a price-cap regime. For example, to regulate Chesapeake and Potomac Telephone Company (C&P), which is the monopoly service provider in the District of Columbia, since January 1993 a price-cap scheme has been adopted in consonance with an earnings sharing scheme where C&P retains all earnings between 11.5% and 13.5% but splits half of all excess earnings yielding a return greater than 13.5% with rate payers (Greenstein et al. 1995). Some of the other states where similar schemes are in operation are California, Florida, New York, and Texas.

Whether a pure price-cap scheme is better than one that combines an earnings sharing component has to be empirically resolved, but theory suggests that a pure price-cap scheme will have superior efficiency properties. One advantage of a price-cap scheme is the short-run de-coupling of prices from costs and profits. This disappears when an earnings-sharing scheme is also included with the price-cap scheme because the profitability of firms has to be constantly monitored for the sharing mechanism to be implemented (Greenstein et al. 1995). For single-state operating companies a dummy variable, coded one, is used to denote the existence of a price-cap scheme that is coupled with an earnings-sharing component for the years studied, and zero otherwise. For multistate operating companies a CAP & SHARING index is constructed in a manner similar to constructing the PRICE CAP index.

A pure earnings-sharing scheme may allow firms to earn a higher rate of profits than rate-of-return based regulation schemes. Its efficiency properties, however, are weaker than that of price caps because profits above a certain level, which may arise due to productivity improvements, are institutionally appropriated. Thereby, incentive to enhance productivity can be dampened. Yet, a number of states have implemented such schemes as an alternate to either rate-of-return or any other form of incentive regulation. Where such is the case in any state, the coding pattern and index-creation procedures followed for creating the variable SHARING are the same that have been followed for creating PRICE CAP and CAP & SHARING. However, the period studied extends between 1988 and 1993, and during this period some states have moved from one form of incentive regulation to another. For example, the state of Wisconsin operated an earnings-sharing scheme for Wisconsin Bell between 1987 and 1989 but moved over in 1991 to a form of pure price-cap regulation (Greenstein et al. 1995). Thus, the way the regulatory variables are constructed captures the changes taking place over time in state-level institutional environments.

2. Technology Effects

The DEA algorithm makes no assumption as to the underlying technology used by firms in its estimation of comparative firm-level efficiency.

Nevertheless, controlling for the effects of rapid technical change taking place in the telecommunications sector is important in any efficiency study. Though earlier studies have found positive results between technical change and productivity, they have been criticized for the use of ad hoc or aggregate measures to capture technical change (Waverman 1989).

From 1988 onward, the FCC data permit the use of finer measures of firm-level technical change, such as the extent of fiber optic diffusion or the level of line digitalization. Both of these are relevant measures of technical progress in the contemporary industry context (Egan 1991). However, in 1991 the plant data reporting format was changed, and digitalization data were reclassified. Therefore, digitalization data for the years 1988-90 are not strictly comparable with data for the years 1991 onward. This creates a problem for the present analysis. Conversely, fiber optic data are comparable for all years. The variable FIBER, which is a relative measure of the diffusion of fiber optic technology into the total network,(7) is introduced in the model and helps to control for the effect of technical change on firm-level efficiency.

The variable FIBER is measured as the ratio of the total miles of fiber optic wiring to the total number of lines and is thus scaled for size. Ideally, if information on the actual number of fiber optic lines were available, then that could be an input variable within the DEA model. A translation of the number of miles of fiber optic wire to actual telephone lines is not feasible because of measurement difficulties. Therefore, the scaled variable is introduced in the second stage of the analysis to control for network technology quality effects.

3. Institutional and Environmental Effects

A key institutional factor within the U.S. telecommunications industry is the way investments and costs of local operating companies are assigned to the interstate market. Thereby, costs may be collected from the long-distance carriers via the separation and settlements process. An accounting division of the local operating companies' plant investments between the federally regulated interstate long-distance activity and state-regulated intra-LATA long-distance and local calling activities has to take place. This is carried out so that all services can bear apportioned cost burdens since, without the local company plant in place, no interstate telephone calls can be delivered to customers. However, plant investment and cost division is difficult because of the inherent difficulty in separating plant investments and costs that are common and incurred on an overall basis for activities associated with operating the entire local telecommunications network.

Regulators have historically attempted to cross-subsidize local exchange rates by allocating a greater proportion of the shared costs to the interstate long-distance jurisdiction, so that a large element of local exchange costs are recovered in long-distance rates. In the absence of detailed econometric studies, the allocation of costs between local and long-distance segments, or between state and federal regulatory domains, is carried out via a politically negotiated process (Bolter 1984). The political attractiveness of local service cross subsidization, and low rates, has been of benefit to local regulators. The FCC, too, has gained political credit by emphasizing one of the most populist items of its statutory mandate, the provision of universal service (Kellogg, Thorne, and Huber 1992).

Theoretically, there are two organizational consequences arising from cross subsidization. First, it permits firms to acquire slack resources within the organization. Such organizational slack enables firms to undertake risky tasks which otherwise would not have been possible (Cyert and March 1963; Thompson 1967). This is an effect with potentially positive outcomes. Conversely, there might be a negative outcome because cross subsidization generates x-inefficiencies (Leibenstein 1976; Shepherd 1983). Where firms are almost guaranteed a resource stream, then incentives to

search for ways to be efficient vanish.

To evaluate the effect of the separations process, a variable, SEPARATION, is constructed using data that are obtained from the FCC Monitoring Report (FCC 1993), prepared by the Federal-State Joint Board. The report identifies for each local operating company its total plant investment and the amounts of these allocated specifically to state as well as federal jurisdictions. Using data from the May 1993 Monitoring Report, SEPARATION is measured as the relative proportion of total investments allocated to the interstate jurisdiction.

The business environment of local operating companies has changed in the late 1980s and the 1990s. For companies with different mixes of business there can be differential effects on performance. There is competition in both toll and local calls markets, in varying degrees. In inter-LATA toll markets competition is intense; however, local operating companies, though demanding the right of entry, were not permitted entry for the period studied. In intra-LATA markets, where local companies have had a monopoly, competition is less intense, though a number of major states permit competition. The number of states opening up this market to other entrants is increasing every year. Intra-LATA toll calls account for almost a third of all calls accounted for by a local company. The variable TOLL CALL, which is the percent of toll calls relative to total calls, helps capture the exposure of companies in toll markets.

In the local calls segment the threat of bypass, a direct connection between a customer's premises and another carrier or a self-contained system avoiding the operating company's system fully (Bolter 1984), is significant. This threat may induce efficiencies since revenues are lost through bypass but all costs still have to be incurred to maintain the network in its present existing size and condition. Business customers are important for revenue-raising purposes and are also the customers most likely to bypass the local network (Bolter, McConnaughey, and Kelsey 1990). The variable BUSINESS LINES, which is the percentage of a firm's lines that are business lines, proxies for the susceptibility of bypass and can positively affect efficiency, though there may be negative efficiency implications arising from having to tailor services to customer needs.

Theory suggests that market power and efficiency have an inverse relationship. Dominant firms, especially in relatively controlled markets such as telecommunications where territory shares have been awarded by institutional fiat and not obtained through market success, do not perceive the threat of instant displacement by newcomers (Scherer and Ross 1990). Such perceptions tend to breed inefficiencies because the availability of a number of customers to whom costs can be passed on is taken for granted (Leibenstein 1976). The variable SWITCH SHARE measures the percentage of switches a company possesses in its given operating area relative to the total number of switches all firms possess in that operating area. It captures relative share of installed base or the scale of a company within its jurisdiction. Its expected effect on productive efficiency is negative.

The structure of the U.S. local telephone industry is, however, varied. There are a number of telephone companies that have only one telephone company mandated to operate in that state. A good example is Maryland, where only the Chesapeake and Potomac Telephone Company of Maryland is allowed to operate. There are a number of companies, such as the Ohio Bell Telephone Company, which operate in only one state, but in that state a number of other operating companies are also allowed to operate. For example, in Ohio GTE is also allowed to operate. For single-state companies such as Ohio Bell, their share of the total state-level switches is relatively straightforward to calculate.

There are a number of multistate operating companies. For multistate firms, I do not have firm-wide, state-level data on the distribution of their switches. In a few cases, these operating companies have the only mandate for providing local telephone services in all of the states that

they operate in. For example, New England Telephone Company operates in Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. In these states, New England Telephone Company is the only local services supplier. For firms such as these, SWITCH SHARE is measured without error.

A number of multistate operating companies provide services in states where there are other providers of local services. For these firms, SWITCH SHARE is calculated as the ratio of their total switches across states relative to the total of all the switches in all of the states in which they operate. A potential measurement error that may arise is that a company may have extremely marginal operations in one state and yet be listed as operating in that state. The SWITCH SHARE calculation is based on a simple averaging process that does not take into account the state-wise distribution of switches by company. Thus, SHARE may be understated for these companies. This measurement problem, however, is not serious because from the data a number of companies can be identified as one-state companies, though listed as operating in two states. New York Telephone Company is a good example. For these firms, the primary state of operation is taken for calculating the denominator of the SWITCH SHARE variable.

4. Firm-Level Characteristics

The size of firms is a correlate of efficiency, and SIZE is introduced as a control variable. Key features of large firms are the diverse capabilities that they possess, coupled with the formalization of procedures. Such attributes make the implementation of operations more effective since several complementary skills can be brought to bear (Penrose 1959). However, alternative points of view suggest that, as firms become larger, efficiency diminishes because of loss of control by top managers over firms' activities (Williamson 1967). Conversely, smaller firms are more flexible and can adapt to situations where rapid decision making with respect to activities is required (Carlsson 1989). The U.S. local operating sector consists of a number of firms of widely varying sizes. Larger firms in the sector also tend to be multistate operators, thereby adding a complexity dimension to their operations. The issue of whether size is positively or negatively correlated with efficiency in the local operating sector is an issue the resolution of which has to be empirical.

Ownership is a key determinant of efficiency (Leibensten 1976). Research has established that in situations where the AT&T-owned local operating companies were able to exploit market power they were relatively inefficient, while the presence of competing independent carriers between 1894 and 1910 reduced such inefficiencies (Bornholz and Evans 1983; Gabel 1994). Research, however, also establishes that the AT&T-owned operating companies, called Baby Bells after 1984, in the postdivestiture period have made radical strategic changes (Schlesinger, Dyer, Clough, and Landau 1987) to outstrip the other independent companies in performance. The variable OWNERSHIP is constructed as a dummy, taking the value of one if a Baby Bell company, and taking the value zero otherwise, and for the period studied Baby Bells are expected to be more efficient than the other local operating companies.

Other firm-level factors play a role in determining performance. The variable COMPENSATION, measured as the average dollar of compensation paid per employee, helps capture differences in the firm- level quality of human capital. There are two possible ways to measure the quality of firm-level human capital. A direct measure is to acquire a breakdown of the total employment within each firm by type of educational qualifications. Where survey research is conducted, this is a feasible measurement alternative. The reality is that firms will not voluntarily release, on an annual basis, details of the educational qualifications of their employees. Alternatively, where publicly released data, such as the data used in the current research, are used, then indirect measures that proxy for the quality of human capital have to be incorporated into the research.

Nevertheless, the use of such proxy measures have to be grounded in theory.

The presence of firm-level high quality human capital, HUMAN CAPITAL, is captured using average compensation per employee as a proxy measure. This approach is in consonance with the efficiency wages literature (Weiss 1990). In the factor market for human capital there can be considerable information asymmetry. The resulting uncertainty regarding the quality of human inputs acquired can lead to an adverse selection problem. Therefore, for acquirers of human capital, paying a lower rate of compensation may significantly lower the average ability of applicants (Akerlof 1970; Wilson 1979). A higher rate of compensation demanded by an applicant is also a signal that she has acquired education and capabilities that may be of use to the organization (Spence 1974). Additionally, a higher rate of compensation has a direct effect on employee productivity, and subsequent firm-level performance, because the level of compensation affects health, mental alertness, and physical well-being. This reasoning is consistent with the development economics literature (Dasgupta and Ray 1986).

The variable CORPORATE COSTS, defined as the percentage of expenses incurred in activities such as planning and human resource development relative to total operating expenses, helps measure the relative quantum of activities being undertaken that aid in the development of a firms' longer-term business capabilities; CUSTOMER COSTS, defined as the pecentage of expenses incurred in activities related to customer and market development, relative to total operating expenses, proxies for the marketing orientation of each company. The more the marketing orientation, the greater can be demand-growth for firms' services resulting in higher call volumes with a given infrastructure of resources.

D. Regression Estimation

A pooled model that corrects for cross-sectional heteroscedasticity and time-wise autoregression is used for estimating the regression model. The specific model used is one recommended by Kmenta (1986), which assumes heteroscedasticity and autoregression but cross-sectional independence. In general, the policy change literature assumes no time lags between policy announcements and their effect (Flood 1992). Nevertheless, this particular assumption may not be tenable with empirical experience. There can be obvious time lags between the implementation of institutional changes and their subsequent effect on firms' behavior, especially where the displacement of one long-established regulatory regime, such as the rate-of-return based system, with another that is more novel in its approach is considered. The model is also estimated using unrestricted 1-period and 2-period lags for the regulatory variables and a 1-period lag for the technology diffusion variable.

The choice of the lag length, as applied to assess the effect of the regulatory variables, depends on a number of factors, and the exact lag length has to be eventually empirically derived from the data of firms' actual experiences. In this study there is, however, one key constraint that limits the number of lags that can be included. This constraint is the very short length of the time series. Also, the policy change being studied is one where events are still taking place, in various state regulatory jurisdictions at the date of estimation. The research is contemporary. The length of time that has passed since occurrence of the actual events is, however, very limited. Assuming that firms are able to make firm-level operating adjustments within a year of the policy change that has taken place, the effect of such a policy change is also assumed to be felt by the second year; thus, estimating the model with a 2-period lag will generate insights as to whether the price-cap policy change has had the hoped-for effect on firms' performance in the near term. As more data become available over time, the issue of optimal regulatory lag can be empirically examined.

IV. Results

The basic results are given in table 1. The estimates in table 1

contain regression results in which the dependent variable is both the technical and scale efficiency scores calculated using the BCC input-conserving algorithm. The control variables are excluded. The scale efficiency score is calculated by dividing the CCR efficiency score by the BCC efficiency score. An input-conserving algorithm is also used for estimating the CCR efficiency scores. Several equation variants are estimated, with different lag structures.

(TABULAR DATA 1 NOT REPRODUCIBLE IN ASCII)

The results for the BCC technical efficiency score are as follows. Equations (1), (2), and (3) in table 1 are estimated with no lag effects, a 1-year lag effect, and a 2-year lag effect, respectively. In all equations the contemporaneous PRICE CAP estimate is not significant. The variable PRICE CAP is significant only for the 2-year lagged estimate in equation (3). Conversely, SHARING & CAP is positive and significant at a 95% level for die contemporaneous estimate in equation (1), the 1-year lagged estimate in equation (2), and the 2-year lagged estimate in equation (3). The variable SHARING is not significant in the contemporaneous model alone. The contemporaneous estimates are positive and significant in equations (2) and (3), the 1-year lagged estimate is negative in equation (2), and the 2-year lagged estimate is negative in equation (3).

Table 2 contains results where the control variables are included in the estimation of the models. The dependent variable in equations (7)-(11), in table 2, is the technical efficiency score. In equation (7) the regulation variables are contemporaneous only; in equation (8) a 1-year lag is included, while in equation (9) a 2-year lag is also included. Initially, the results of equations (7)-(9) are discussed. These are the primary results. In equations (7), (8), and (9) the contemporaneous estimates of PRICE CAP are negative but not significant, or only somewhat significant, while the lagged estimates of SHARING & CAP are significant. The contemporaneous SHARING & CAP variable is significant and positive in equation (7) but not significant in equations (8) and (9). The contemporaneous estimate for SHARING is positive in all three equations and significant in equations (8) and (9).

(TABULAR DATA 2 NOT REPRODUCIBLE IN ASCII)

The one-period lagged estimates for PRICE CAP remain negative in equations (8) and (9), being significant at 90% in equation (9). Correspondingly, the 1-period lagged estimates for SHARING & CAP remain positive in equations (8) and (9), being significant at 95% in equation (8). Interestingly, the 1-period lagged estimates for SHARING turn negative in equations (8) and (9), being significant at 95% in equation (9). The 2-year lagged estimates in equation (9) display interesting patterns that merit attention. The variables PRICE.CAP and SHARING & CAP are both positive and significant at the 95% level in this equation; the magnitude of the PRICE CAP coefficient is, however, larger than that of SHARING & CAP. The coefficient of SHARING is negative, as in equation (8), and is strongly significant.

What do these results imply? The introduction of pure price-cap schemes does positively and significantly affect the technical efficiency of the local operating companies, as expected, but only after a 2- period lag. Conversely, perhaps because rate-of-return regulation is so widespread, a combination of price-cap and earnings-sharing schemes that is captured by the SHARING & CAP variable has both immediate as well as persistent effects on efficiency. A comparison of the magnitudes of the significant PRICE CAP and SHARING & CAP variables are, however, in order. Such comparison reveals that the magnitude of the PRICE CAP variable is greater than that of the SHARING & CAP variable over the longer haul. Though it takes longer for the introduction of pure price-cap regulation schemes to make their effects felt, ultimately the effect on firms' productivity is consistent with expectations. The policy change that has taken place in the U.S. telecommunications industry positively affects

economic performance, as measured by the firms' x-efficiency, though the outcomes may not be immediate because of hysteresis effects present in firms' behavior and the novelty of inventive regulation schemes.

The results also show that the introduction of pure earnings-sharing schemes in the various regulatory jurisdictions is not conducive to long-run efficiency. In the immediate aftermath of the introduction of earnings-sharing schemes efficiency is found to be positively enhanced, as equations (2), (3), (8), and (9) particularly show. There can be novelty effects associated with the introduction of earnings-sharing schemes because an institutional change has been made; however, these novelty effects wear off rapidly, and earnings-sharing schemes have a negative effect on efficiency. Pure earnings-sharing plans mimic rate of-return-type regulatory schemes as far as x-inefficiency consequences are concerned. Their effect can be as detrimental to economic performance as the effect of rate-of-return regulation.

Profit sharing may or may not induce the overinvestment in capital assets effect that rate-of-return regulation engenders. That still remains an unexplored empirical issue. It, however, has x-inefficiency-inducing properties. In a pure profit or earnings-sharing scheme prices are not capped. What an earnings-sharing scheme does is institutionalize the ad hoc process of rate reviews that are carried out under rate-of- return regulation if profits are too low or too high (Greenstein et al. 1995). Therefore, costs can still be passed on to customers as in a rate-of return scheme. Even if there was an incentive to be efficient, the sharing of profits is like a tax that reduces efficiency incentives further since firms do not have the wherewithal to retain the benefits from**cost** savings. In fact, Braeutigam and Panzar (1993) label the earnings**sharing** schemes as sliding-scale, rate-of-return regulation.

The implications of the estimates obtained for the control variables in equations (7), (8), and (9) are discussed next. The variable FIBER captures technology diffusion, and the finding that technical change has a strong and positive effect on efficiency is not counterintuitive. The contemporaneous effect of FIBER is, however, weakly negative or positive and not significant. The 1-year lagged estimate of FIBER is positive and strongly significant. The finding that new technology adopters perform better, albeit after a 1-period lag because of adjustment costs is not novel but is arrived at after disaggregated analysis.

An aspect of the political economy in the U.S. telecommunications industry is the nature of the separations regime each operating company faces. This regime describes the extent to which total network costs can be allocated to the federal jurisdiction and the extent of toll- local cross-subsidies. The variable SEPARATION is positive in two of the equations but not significant. The economic effect of cross subsidization, nevertheless, is an important issue in the telecommunications industry warranting further empirical work. The variable TOLL CALL is positive and significant. Toll calls are more profitable than local calls. In inter- and intra-LATA toll-markets competitive forces are intense, and the intensity is exacerbated daily. Companies processing a greater proportion of toll calls face strong threats of entry from new players, and such threats seem to induce the firms to be more efficient.

The extent of business lines, BUSINESS LINE, does not induce efficiencies, suggesting that there can be diseconomies in serving idiosyncratic customer needs. The variable SWITCH SHARE is negative. Firms with greater institutionally granted market power do perform worse than other firms. This finding is consistent with theory (Scherer and Ross 1990). The variable SIZE is negatively correlated with performance. The dependent variable evaluated is technical efficiency, irrespective of scale effects. The results imply that organizational diseconomies characterize local operating company operations. Some of the local operating companies are individually larger than the post telegraph and telephone

administrations of many of the smaller countries in the Organization for Economic Cooperation and Development; additionally, a number of these companies operate across multiple states. Operational coordination and managerial communications may not necessarily be effective in such organizational settings. The results also question the penchant of regional holding companies in consolidating their stand-alone local operations into one large operating entity.

The variable OWNERSHIP is consistently positive. Whether the companies are among the Baby Bells or not strongly influences performance, with the non-Baby Bells being less technically efficient than the Baby Bells. Greater levels of spending on human capital, COMPENSATION, on creating corporate capabilities, CORPORATE COSTS, and on market-development activities, CUSTOMER COSTS, are positively associated with superior performance. Admittedly, the last three variables are significant in equation (9) only.

Table 2 also includes results for two additional sets of regressions, equations (10) and (11). Equation (10) includes a time-index variable to pick up unspecified temporal effects that may not have been picked up in the other models. The coefficient of this variable is not shown in table 2; the results that are obtained, however, do not change with the inclusion of this variable in the model. All the parameter estimates and the t-statistics remain broadly the same.

Equation (11) includes a set of dummy variables to account for holding company effects. The regulatory variables in all of the equations are firm-specific. These variables pick up the situations in which multistate firms participate across regulatory jurisdictions. The dummy variable controls for holding company effects, and it could make a difference if an operating company is either a part of one of the holding companies or an independent operating company, since each holding company can have a corporate approach to regulatory environment management. There can be spillover benefits of a group regulatory approach within the operating companies in the group, even if the operations of the companies are spread all over the United States.

The holding company groups are the Regional Holding Companies, which are Ameritech, Bell Atlantic, Bell South, NYNEX, Pacific Telesis, Southwestern Bell, and U.S. West, and the independent operating companies or operating company groups, such as Cincinnati Bell, SNET, CENTEL, CONTEL, GTE, Rochester Telephone (now Frontier Communications), and United Telephones (now Sprint). The base case for comparison is Lincoln Telephone Company. The holding company dummy variable coefficients are not displayed in equation (11). The overall conclusions do not materially change by including this control, but the results have to be treated very cautiously because there is significant multicollinearity between the holding company dummy variables and the regulatory variables. The variable PRICE CAP remains contemporaneously negative, but a positive 1-year lagged effect is felt, while the 2-year lagged effect is also still positive. The signs for SHARING & CAP and SHARING remain as in equations (9) and (10).

V. Conclusions

This article has investigated whether the introduction of incentive regulation schemes by the state-level public utility commissions has had an effect on the productive efficiency of local operating companies in the U.S. telecommunications industry. Inefficiencies arise in several ways due to regulatory reasons. The input mix can be out of line with norms; a criticism of rate-of-return regulation is the inducing of unnecessary capital investments. Also, firms may not utilize their resources in the most effective manner and be x-inefficient. This study has been specifically concerned with whether or not the introduction of incentive regulation induces firms to be x-efficient relative to the firms that still face a rate-of-return regime in their regulatory jurisdictions.

Technical and scale efficiencies are measured, using data envelopment

analysis, for the period 1988-93. The results obtained are these: First, the introduction of price-cap schemes alone as a replacement for a rate-of-return regime has a strong and positive, but lagged, effect on the technical efficiency of local exchange carriers. Second, price-cap schemes can be introduced in conjunction with an earnings-sharing scheme, a mode of regulation that is similar to rate-of-return regulation. Where this is the case, then, though there is a positive and more immediate effect on technical efficiency, the effect is less strong compared to the effect of a pure price-cap scheme alone. Third, where only an earnings-sharing scheme is introduced, its effect over time is detrimental to technical efficiency. Fourth, weaker, though broadly positive, results are obtained with respect to the effect of incentive regulation on scale efficiency.

The introduction of price-cap regulatory mechanisms is not widespread in the local exchange sector of the U.S. telecommunications industry, yet it is a natural experiment in regulatory policy, the effect of which is positive and has had beneficial productivity consequences where it has been been introduced. The lagged productivity effect may disappear once the introduction of a price-cap scheme as a regulatory strategy is adopted among all the state regulatory commissions. Thus, the noted effect may turn out to be contemporaneous. A price-cap-cum-earnings-sharing scheme contains aspects of both incentive and rate-of-return regulation in its design; while its effect is ultimately positive, the relative effect of such a scheme compared to a price-cap scheme alone is of a lesser magnitude. A pure earnings-sharing scheme mimics a rate-of-return regulatory scheme; its effect is negative, and it is not found to be a viable regulatory option. Therefore, a reevaluation of such schemes in the states where they have been implemented is warranted.

The results reveal that the overall regulatory policy change seems to have worked. At the research level three issues need following up as more data become available. This study uses recent data with a very short time series, andexperiment under way is still in the process of unfolding in various states. First, as more states convert to incentive regulation, it is necessary to assess whether lag effects disappear, as firms join the bandwagon in speedily accepting these regulatory schemes and changing behavior accordingly. Next, price-cap schemes operate for a finite period. Since regulatory lag length positively affects performance (Vogelsang 1989), an issue in designing incentive regulation schemes revolves around optimal lag length. The determination of optimal lag length is an issue that empirical analysis relating lag length to efficiency can help elucidate. The benefits of incentive regulation are associated with firms making investments in cost-reducing technology as well as the reduction of x-inefficiencies. A simultaneous evaluation of these effects can also be carried out as longer time-series data of firms' experiences become available.

For transition or developing economies that are designing regulatory systems for their telecommunications sectors from scratch, or other economies that are redesigning their regulatory systems, the implication from the study is, clearly, that implementation of a price- caps scheme will be the best alternative. In many countries, the absence of any formal regulatory mechanism implies that there is an opportunity to leapfrog over the rate-of-return regime, one that is shown to be relatively less conducive to productivity enhancements, into one that is economically beneficial -- the price-caps regime. While new regulatory systems are being designed, it has to be kept in mind that a pure price-cap scheme is the best option from a productivity viewpoint, while other schemes such as earnings-sharing have considerably reduced, or even an opposite, effect.

Finally, the U.S. telecommunications industry has provided researchers with a rich and fascinating laboratory to study the process of industrial transformation. A key factor that affects the behavior and performance of firms -- thereby aiding, or even perhaps retarding, the

process of transformation -- is institutional change. This study has focused on the key institutional factor important in the telecommunications sector, the nature of the regulatory regime and what effect regime changes have had in engendering productive efficiency gains in the U.S. telecommunications industry. The research approach adopted, a combination of data envelopment analysis and regression analysis, permits firm-level assessment of productive efficiency gains and enhances understanding of industrial transformation at a detailed microlevel. Similar studies, based on the research approach demonstrated in this study, can help generate insights and knowledge about the transformations under way in many other industries, in the United States as well as around the world, and the role that institutional changes play in driving such transformations.

(1.) Their principal findings were that rate-of-return regulation induces large productive inefficiencies, pricing of competitive outputs below marginal cost and overinvestment in plant capacity, and their analytical conclusions were extended and corroborated by Bailey (1973).

(2.) Though the assumptions of the A-J model have been questioned (Joskow 1973), a number of empirical studies (Courville 1974; Spann 1974; Peterson 1975; Hayashi and Trapani 1976), set primarily in the context of the electric utility industry, have established that the A-J effect holds.

(3.) Local operating companies provide double the level of telecommunications services compared to the volume of services provided by the long- distance carriers in the U.S. Local operating companies provide not only local (residential and business) telephone services but also intra-LATA toll services, which, as a separate category of service, accounts for around a third of all calls provided by a local operating company.

(4.) A recent detailed documentation of local level regulatory environments (Greenstein et al. 1995) finds that 22 states have implemented price- cap schemes, of which 8 operate pure price-cap schemes and 14 operate some form of an earnings-sharing mechanism in conjunction with a price-cap scheme. In addition, 14 states operate an earnings-sharing scheme exclusive of a price-cap component. In all other states, rate-of-return based regulation exists.

(5.) See Seiford (1996) for details of the DEA models and the associated literature.

(6.) Ideally, DEA human capital inputs should be various types of labor hours or various types of people. Then, one can gauge by looking at slack and input-usage analysis how different varieties of human capital play a role in enhancing productivity. There is a lack of publicly available data on different personnel categories within the firms studied.

(7.) Since 1986 the total deployment of fiber optics in aggregate has also risen sharply, from 882,000 route-miles to 6,331,000 route-miles by 1993. The actual route-miles deployment figures, on a year-to-year basis, are as follows -- 1986: 882,000; 1987: 1,206,000; 1988: 1,783,000, 1989: 2,297,000; 1990: 3,249,000; 1991: 4,389,000; 1992: 5,738,000; and 1993: 6,331,000 (Kraushaar 1994).

References

Akerlof, G. A. 1970. The market for lemons: Quality, uncertainty and the market mechanism. Quarterly Journal of Economics 84 (August): 488-500.

Averch, H. A., and Johnson, L. L. 1962. Behavior of a firm under regulatory constraint. American Economic Review 52, no. 3:1053-69.

Bailey, E. E. 1973. Economic Theory of Regulatory Constraint. Lexington, Mass.: Lexington Books.

Banker, R. D.; Charnes, A.; and Cooper, W. W. 1984. Some models for estimating technical and scale efficiencies in data envelopment analysis. Management Science 30, no. 9: 1078-92.

Bolter, W. G. 1984. Telecommunications Policy for the 1980s: The Transition to Competition. Englewood Cliffs, N.J.: Prentice Hall.

Bolter, W. G.; McConnaughey, J. W.; and Kelsey, F. J. 1990.

Telecommunications Policy for the 1990s and Beyond. Armonk, N.Y.: M. E. Sharpe.

Bornholz, R., and Evans, D. S. 1983. The early history of competition in the U.S. telecommunications industry. In D. S. Evans (ed.), Breaking Up Bell: Essays on Industrial Organization and Regulation. New York: Elsevier.

Braeutigam, R. R., and Panzar, J. C. 1993. Effects of the change from rate-of-return to price-cap regulation. American Economic Review 83, no. 2:191-98.

Carlsson, B. 1989. Flexibility and the theory of the firm. International Journal of Industrial Organization 7:179-203.

Charnes, A.; Cooper, W. W.; Golany, B.; Seiford, L. M.; and Stutz, J. 1985. Foundations of data envelopment analysis for Pareto-Koopmans efficient empirical production functions. Journal of Econometrics 41 (October- November): 91-107.

Charnes, A.; Cooper, W. W.; and Rhodes, E. 1978. Measuring the efficiency of decision making units. European Journal of Operations Research 2, no. 6:429-44.

Courville, L. 1974. Regulation and efficiency in the electric utility industry. Bell Journal of Economics and Management Science 5 (Spring): 53-74.

Cyert, R. M., and March, J. G. 1963. A Behavioral Theory of the Firm Englewood Cliffs, N.J.: Prentice-Hall.

Dasgupta, P., and Ray, D. 1986. Inequality as a determinant of malnutrition and unemployment: Theory. Economic Journal 96:1011-34.

Davis, O., and Rhodes, E. 1990. Evaluating performance in regulated and unregulated markets: A collection of fables. In J. R. Allison and D. L. Thomas (eds.), Telecommunications Deregulation: Market Power and Cost Allocation Issues. Westport, Conn.: Quorum Books.

Egan, B. 1991. Information Superhighways: The Economics of Advanced Public Telecommunications Networks. Norwood, Mass.: Artech House.

Farrell, M. J. 1957. The measurement of productive efficiency. Journal of the Royal Statistical Society, ser. A (General), 120, no. 3:253-81.

Federal Communications Commission. Annual. Statistics of Communications Common Carriers. Washington, D.C.: Federal Communications Commission.

Federal Communications Commission. 1993. Monitoring Report. Washington, D.C.: Federal Communications Commission.

Federal Communications Commission. 1992. Price Cap Performance Review for AT&T: Notice of Inquiry. Washington, D.C.: Federal Communications Commission.

Federal Communications Commission. 1987. Further notice of proposed rulemaking in the matter of policy and rules concerning rates for dominant carriers. CC Docket No. 87-313. Washington, D.C.: Federal Communications Commission.

Flood, R. P. 1992. What is policy switching? Finance and Development 29, no. 3:33-35.

Gabel, D. 1994. Competition in a network industry: The telephone industry, 1894-1910. Journal of Economic History 54 (September): 543-72.

Green, J. H. 1992. The Business One Irwin Handbook of Telecommunications. 2d ed Homewood, Ill.: Business One Irwin.

Greenstein, S.; McMaster, S.; and Spiller, P. 1995. The effect of incentive regulation on local exchange companies' deployment of digital infrastructure. Journal of Economics and Management Strategy 4:187-236.

Hayashi, P. M., and Trapani, J. M. 1976. Rate-of-return and the regulated firm's choice of capital-labor ratio: Further evidence on the Averch-Johnson model. Southern Economic Journal 52 (January): 384-98.

Joskow, P. 1973. Pricing decisions of regulated firms: A behavioral approach. Bell Journal of Economics and Management Science 4 (Spring): 118-40.

Kahn, A. E. 1988. The Economics of Regulation. 2d ed. Cambridge,

Mass.: MIT Press.
Kellogg, M. K.; Thorne, J.; and Huber, P. W. 1992. Federal Telecommunications Law Handbook. Boston: Little, Brown.
Kmenta. J. 1986. Elements of Econometrics. 2d ed. New York: Macmillan.
Kraushaar, J. M. 1994. Fiber Deployment Update: End of Year 1993. Washington, D.C.: Federal Communications Commission.
Leibenstein, H. 1976. Beyond Economic Man. Cambridge, Mass.: Harvard University Press. Littlechild, S. C. 1983. Regulation of British Telecom's profitability. Report to the Secretary of State for Trade and Industry. London: Department of Trade and Industry.
Majumdar, S. K. 1995. X-efficiency in emerging competitive markets: The case of U.S. telecommunications. Journal of Economic Behavior and Organization 26, no. 1:129-44.
Mathios, A., and Rogers, R. 1989. The impact of alternative forms of state regulation on direct-dial, long-distance telephone rates. Rand Journal of Economics 20, no. 3:437-53.
Penrose, E. T. 1959. The Theory of the Growth of the Firm. New York: Wiley.
Petersen, H. C. 1975. An empirical test of regulatory effects. Bell Journal of Economics 6 (Spring): 111-26.
Scherer, F. M., and Ross, D. 1990. Industrial Market Structure and Economic Performance. 3d ed. Boston: Houghton Mifflin.
Schlesinger, L. A.; Dyer, D.; Clough, T. N.; and Landau, D. 1987. Chronicles of Corporate Change: Management Lessons from AT&T and Its Offspring. Lexington, Mass.: Lexington Books.
Seiford, L. M. 1996. Data envelopment analysis: The evolution of the state of the art (1978-1995). Journal of Productivity Analysis 7 (July): 99-137.
Seiford, L. M., and Thrall, R. M. 1990. Recent developments in DEA: The mathematical programming approach to frontier analysis. Journal of Econometrics 46:7-38.
Shepherd, W. G. 1983. Concepts of competition and efficient policy in the telecommunications sector. In E. M. Noam (ed.), Telecommunications Regulation: Today and Tomorrow. New York: Harcourt Brace Jovanovich.
Skoog, R. E. 1980. The Design and Cost Characteristics of Telephone Networks. Murray Hill, N.J.: AT&T Bell Telephone Laboratories.
Spann, R. M. 1974. Rate-of-return regulation and efficiency in production. Bell Journal of Economics and Management Science 5, no. 1:623-32.
Spence, A. M. 1974. Market Signaling. Cambridge, Mass.: Harvard University Press.
Thompson, J. D. 1967. Organizations in Action. New York: McGraw-Hill.
Vogelsang, I. 1989. Price cap regulation of telecommunications services: A long-run approach. In M. A. Crew (ed.), Deregulation and Diversification of Utilities. Boston: Kluwer Academic Publishers.
Waverman, L. 1989. U.S. inter-exchange competition. In R. W. Crandall and K. Flamm (eds.), Changing the Rules: Technological Change, International Competition and Regulation in Communications. Washington, D.C.: Brookings Institution.
Weiss, A. 1990. Efficiency Wages. Princeton, N.J.: Princeton University Press.
Williamson, O. E. 1967. Hierarchical control and optimum firm size. Journal of Political Economy 75:123-38.
Wilson, C. 1979. Equilibrium and adverse selection. American Economic Review 69, no. 2:313-17.

Appendix

Description of Variables

PRODUCTIVE EFFICIENCY = The log of the technical and scale efficiency scores computed using DEA for each firm-level observation for the years 1988-93.

PRICE CAP = A variable that for single-state operating companies equals one if pure price-cap regulation exists in the state that the company operates in, and zero otherwise; for multistate operating companies, a composite index variable is constructed, with one denoting the existence of pure price-cap regulation, and zero otherwise, for each of the states the company operates in, by weighting the presence of price-cap regulation in each such state by the proportion of total loops contributed by that state to the total number of local loops operated by the company.

SHARING & CAP = A variable that for single-state operating companies equals one if price-cap regulation combined with an earnings-sharing scheme exists in the state that the company operates in, and zero otherwise; for multistate operating companies an index variable is constructed following the approach used for the PRICE CAP variable.

SHARING = A variable that for single-state operating companies equals one if an earnings-sharing scheme exists in the state that the company operates in, and zero otherwise; for multistate operating companies an index variable is constructed following the approach used for the PRICE CAP and SHARING & CAP variables.

FIBER = The percentage of miles of fiber optic wires scaled relative to the total number of lines that are operated by an operating company.

SEPARATION = The percentage of an operating company's total investment that is allocated to the interstate jurisdiction via the separations process.

TOLL CALL = The percentage of toll calls relative to the total number of calls for each operating company.

BUSINESS LINES = The percentage of business lines relative to the total number of lines for each company.

SWITCH SHARE = The percentage of switches operated by each company relative to the total switches that are operated in its operating territory.

SIZE = The log of deflated total revenues for each company.

OWNERSHIP = A dummy variable that equals one if the observation is of one of the Baby Bell companies, and zero if it is of an independent operating company.

COMPENSATION = The average dollar value of compensation cost per employee.

CORPORATE COSTS = The percentage of costs spent on corporate development activities relative to the total operating costs of each company.

CUSTOMER COSTS = The percentage of costs spent on customer support and development activities relative to the total operating costs of each company.

SPECIAL FEATURES: illustration; table
INDUSTRY CODES/NAMES: BUS Business, General; BUSN Any type of business
DESCRIPTORS: Price control--Analysis; Telecommunications services industry--Laws, regulations, etc.; Incentives (Business)--Analysis; Industrial productivity--Analysis
FILE SEGMENT: MC File 75

?

T S4/9/6

4/9/6 (Item 1 from file: 349)
DIALOG(R)File 349:PCT FULLTEXT

00449446 **Image available**

DYNAMIC SPLIT BILLING OF TELEPHONE CALLS
TAXATION DYNAMIQUE DIVISEE D'APPELS TELEPHONIQUES

Patent Applicant/Assignee:
AT & T CORP,
Inventor(s):
JAGADISH Hosagrahar V,
MUMICK Inderpal S,

Patent and Priority Information (Country, Number, Date):
Patent: WO 9839910 A1 19980911
Application: WO 98US2493 19980209 (PCT/WO US9802493)
Priority Application: US 97814178 19970307
Designated States: CA JP MX AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE
Main International Patent Class: H04M-015/00
Publication Language: English
Fulltext Word Count: 4070

English Abstract

A telephone call placed by an originating subscriber to a terminating subscriber is billed by first connecting the telephone call between the originating subscriber and the terminating subscriber. A signal initiating split billing is received, then a signal indicating a billing portion is received. Both the originating subscriber and the terminating subscriber are billed for at least a portion of the cost of the telephone call, based on the indicated billing portion. The billing portion may be specified as a percentage, a monetary value, or a time period. Split billing may be initiated by the originating subscriber in the situation in which the terminating subscriber was responsible for the entire cost of the call prior to split billing being initiated. Split billing may be initiated by the terminating subscriber in the situation in which the originating subscriber was responsible for the entire cost of the call prior to split billing being initiated.

French Abstract

On taxe un appel telephonique passe par un abonne emetteur a un abonne recepteur en connectant d'abord l'appel telephonique entre l'abonne emetteur et l'abonne recepteur. Un signal declenchant la taxation divisee est recu, apres quoi un signal indiquant une portion de taxation est recu. L'abonne emetteur et l'abonne recepteur sont tous deux taxes pour au moins une partie du cout de l'appel telephonique, en fonction de la portion de taxation indiquee. La portion de taxation peut etre specifiee sous forme de pourcentage, de valeur pecuniaire, ou d'intervalle de temps. La taxation divise peut etre declenchee par l'abonne emetteur dans une situation dans laquelle l'abonne recepteur assumait le cout integral de l'appel avant le declenchement de la taxation divisee. La taxation divise peut etre declenchee par l'abonne recepteur dans le cas ou l'abonne emetteur assumait le cout integral de l'appel avant le declenchement de la taxation divisee.

Detailed Description

DYNAMIC SPLIT BILLING OF TELEPHONE CALLS

Field of the Invention

The present invention relates to the processing of telephone calls, and in particular, to the billing of the costs of such calls.

Background of the Invention

The cost of a telephone toll call placed between telephone subscribers is typically billed to the subscriber originating the call (originating subscriber). It is well-known to shift the entire cost of a call to the recipient of the call (terminating subscriber). For example,

collect
calling allows a caller to shift the cost of individual calls to the terminating subscriber, with the permission of the terminating subscriber given on a call-by-call basis. Another example is Inward WATS or "800" number service, in which the cost of all calls placed to a particular number are shifted to the terminating subscriber.

It is known to shift a portion of the cost of a call on a predefined basis. For example, in the Telephone Call Billing System of Patent No.

5,381,467 to Rosinski et al., at least of portion of the period cost associated with at least one of the indivisible time periods of a**toll**
callis
assigned to both the terminating and originating subscribers. The apportionment of the basic cost of a call is automatically authorized according to a predetermined agreement as to the**sharing**of each of the call's period costs. An authorization signal is required in order for
cost
sharingto occur. In one embodiment, the authorization signal -is automatically generated, if the originating subscriber meets predetermined criteria with respect to each call. In another embodiment, the authorization signal is developed in response to actions taken by the terminating subscriber after call setup by, for example, keying predefined codes via telephone keyboard. Thus, the terminating subscriber is given the option of accepting a predefined portion of the cost of a call, or allowing the originating subscriber to pay the entire cost of the call. This prior art system does not provide a subscriber with
the capability to define a**cost** **sharing**arrangement after the call has
been connected. In addition, this system only provides**cost** **sharing** when the subscriber that would not normally be charged for the call is the terminating subscriber
In the telephone billing method of Patent No. 5,146,491 to Silver et al., a toll-free number is provided to a customer to access a provider in a**toll** -free□call□from an originating customer telephone number. The
originating customer telephone number is received in response to the **toll** -free□call□ . The□toll□ -free□call□is converted to a billable call during or after the**toll** -free□call□and the billable call is billed to the originating
customer telephone number. This method provides the capability to charge goods or services that are purchased by the originating customer to the originating customer's telephone bill. The monetary amounts charged to the customer depend on the items purchased, not on the actual**cost**of the telephone call. It does not provide□cost sharing□ of the**cost**of the telephone call.
It is desirable to provide the capability to define an arrangement for**sharing**the□cost□of a telephone call after the call has been connected.

Likewise, it is desirable to provide**cost** **sharing**capability to the subscriber that would not normally be charged for the call, regardless of whether that 'party is the originating subscriber or the terminating subscriber.

Summary of the Invention
The present invention is a method and system for billing a telephone call which provides a subscriber with the capability to define an arrangement for**sharing**the□cost□of a telephone call after the

call has been connected. It provides**cost sharing**capability to the subscriber that
party is the originating subscriber or the terminating subscriber
A telephone call placed by an originating subscriber to a terminating subscriber is billed by first connecting the telephone call between the originating subscriber and the terminating subscriber. A signal initiating split billing is received, then a signal indicating a billing
portion is received. Both the originating subscriber and the terminating subscriber are billed for at least a portion of the cost of the telephone call, based on the indicated billing portion.

The billing portion may be specified as a percentage, a monetary value, or a time period. Split billing may be initiated by the originating
subscriber in the situation in which the terminating subscriber was responsible for the entire cost of the call prior to split billing being initiated. Split billing may be initiated by the terminating subscriber in the situation in which the originating subscriber was responsible for the entire cost of the call prior to split billing being initiated.

Brief Description of the Drawings
The details of the present invention, both as to its structure and operation, can best be understood by referring to the accompanying drawings, in which like reference numbers and designations refer to like elements.

Fig. la is a block diagram of one embodiment a telephone call billing system, in which the present invention may be implemented.

Fig. lb is a block diagram of the telephone call billing system of Fig. la, showing AMA records according to the present invention.

Fig. 2a is a flow diagram of the operation of a dynamic split billing process according to the present invention.

Fig. 2b is a flowchart depicting the steps involved in a procedure that a billing analysis system may use to perform dynamic split billing processing for each call, according to the present invention.

Fig. 3 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Fig. 4 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Detailed Description of the Invention
Referring to Fig. la, there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database (CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS(qi9 switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It

should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

In any event, once the AMA record has been passed to the CDD, it is available for use in pricing the call. To this end, the AMA record is passed to a billing analysis system 112, which may be a general purpose computer capable of running the software necessary to implement the invention. The billing analysis system applies any subscriber specific billing parameters to the AMA record to produce a processed AMA record. It then passes both the AMA record and the processed AMA record back to the CDD for storage. A method for passing the data back to the CDD is disclosed in co-pending, commonly assigned, US Patent Application Serial No.: 08/607,983 entitled "Compression and Buffering of a Stream with Data Extraction Requirements" - which application is incorporated herein by reference.

The billing analysis system performs its functions the instant the switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records the invention must overcome two primary obstacles.

First, the subscriber specific data is fragmented across multiple business units, with no cohesive notion of an integrated subscriber profile. This situation is depicted in Fig. 1a, which shows several subscriber profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated subscriber profile database located within the billing analysis system. Software tools update the integrated subscriber profile database in response to updates of the individual subscriber profiles 114, 116 and 118 so that the integrated database always contains current information on all subscribers.
The volume of subscriber and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a subscriber's current bill. Thus, one type of accumulated summary information may be current bills for each network subscriber. Nevertheless, it may be useful to accumulate other types of summary information for particular subscribers. The nature of the accumulated summary information for a particular subscriber depends upon the services subscribed to by that subscriber. For example, a subscriber may subscribe to a plan in which calls made during the hours between 5:00pm and 9:00am receive a 10% discount; in which case it is useful to maintain a summary field containing the number of minutes of calls that the subscriber has made during the discount period.

In any case, the summary information is stored in a Summary Database (SD) 113 that is located within the billing analysis system.

Thus, in this embodiment, AMA records and processed AMA records are stored in the CDD, while summary information is stored in the SD. It should be noted that many alternative storage schemes may be employed without departing from the spirit of the invention. For

example, in one alternative scheme, AMA records are stored in the CDD, summary information are stored in the SD, and processed AMA records are stored in both the CDD and SD.

The processing involved in dynamic split billing is shown in Fig.

lb, which, as an example, shows the present invention implemented in the telephone billing system of Fig. la. The present invention may be similarly implemented in the telephone billing systems shown in Figs. 3 and 4.

A subscriber places a call from calling station 152. Each call is routed through a network switch 156, which generates a corresponding AMA record 160. The AMA record includes an indication of a primary subscriber for the AMA record and the call information needed to determine the cost of the call. Typically, the primary subscriber is the subscriber who would pay for the call if split billingis not invoked. The AMA record also includes split billing information 161, which includes an indication of the secondary subscriber and the split portion, which is the portion of the cost of the call that the secondary subscriber will pay. The split portion may be indicated in several ways, such as a maximum monetary value, a percentage of the cost of the call, or by a number of minutes of the call.

The present invention handles split billing for both inbound and outbound services. In outbound service, the originating subscriber is initially responsible for the cost of the call. The terminating subscriber
may initiate split billing if desired. The originating subscriber is indicated as the primary subscriber in the AMA record. The Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. The terminating subscriber is indicated as the secondary subscriber in the AMA record. The dialed number is used for this purpose.

In inbound service, the terminating subscriber is initially responsible for the cost of the call. The originating subscriber may initiate split billing if desired. The terminating subscriber is indicated
as the primary subscriber in the AMA record. The dialed number is used for this purpose. The originating subscriber is indicated as the secondary subscriber in the AMA record. The ANI is used for this purpose.

The AMA record is passed to CDD 158, making the record available for call pricing. The AMA record is passed from CDD 158 to billing analysis system 162, which determines the cost of the call.

Billing analysis system 162 determines a total cost of the call based on the call information in the ANIA record. Billing analysis system 162 also determines the portion of the total cost of the call that is to be paid
by the secondary subscriber, based on the information in split billing information 161. Billing analysis system 162 then generates processed AMA record 163, which includes the charges for the call that are to be billed to the primary subscriber, and processed AMA record 164, which includes the charges for the call that are to be billed to the secondary subscriber. The AMA records are generated based on each subscriber's

profile in the subscriber profile databases connected to billing analysis system 162, such as subscriber profile database 165. AMA records 163 and 164 are then passed back to CDD 158, where they are stored until billed to the subscriber.
A flow diagram of the operation of a dynamic split billing process is shown in Fig. 2a. The process begins with an originating subscriber placing a call to a terminating subscriber (step 202). The secondary subscriber in the call, which is the terminating subscriber in outbound service and the originating subscriber in inbound service, initiates split
billing (step 204). Split billing may be indicated by entering a first touch-tone code into the keypad of a telephone station, or by transmitting the touch-tone code from a computer, or a signaling code from a PBX. The code is received by network switch 156, which typically indicates receipt of the first touch-tone code by transmitting an
audio prompt, such as a tone or voice message, to the secondary subscriber. The secondary subscriber then indicates the portion of the call for which he will pay (step 206). The portion may be indicated by entering a second touch-tone code into the keypad of thetelephone state, or by transmission from a computer or PBX.

Network switch 156 then generates an AMA record 160, including the primary subscriber, call information and split billing information including the secondary subscriber and the split portion (step 208). The AMA record is passed to the CDD (step 208). The billing analysis system then performs the processing necessary to bill both the primary subscriber and the secondary subscriber for their respective portions of the cost of the call (step 210).

Fig. 2b shows, in flowchart form, a procedure that a billing analysis system may use to perform dynamic split billing processing for each call. In the following description of the flowchart references will be made to the embodiment shown in Fig. 1b.

Upon receiving an AMA record, such as 160a from CDD 158, the first step billing analysis system 162 takes is to rate the total call (step 252). It then determines the portion of the total call that is to be
paid by the secondary subscriber from the information in split billing information 161 (step 254). The portion to be paid by the primary subscriber is the remainder of the cost of the call. This is also determined (step 254). It must then match the rated call to the subscriber so that subscriber specific parameters can be applied to the call (step 256). Several well known techniques can be used to match the rated call to the subscriber. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party, the originating subscriber, who initiated the call.

The terminating subscriber may be identified based on the dialed number. Accordingly, in the Fig. 1b embodiment, the number of a telephone, such as 152 or 154, may be determined and passed to the billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the subscriber profile containing the subscriber specific data to be used for the current call.

Once the appropriate profiles have been determined, the billing

analysis system applies the subscriber specific data contained in the profiles to the rated call to produce a priced call value for the primary subscriber's portion of the call and for the secondary subscriber's portion of the call (step 256). Each priced call value may be added to the respective subscriber's previous balance to create a new balance, or "current bill" for each subscriber (step 258). Finally, the priced call value (processed AMA record) for each subscriber is stored in the CDD, and the current bill (summary information) for each subscriber is stored in the SD (step 262). As described in relation to Fig. 1a, an alternative scheme is to store both the priced call value and current bill
collectively termed "the priced call data" - in the SD; in which case, step 262 would involve storing the priced call value and the current bill in the SD.

As an optional step in the procedure of Fig. 2b, the billing analysis system may adjust charges for old calls to reflect certain types of billing plans, such as usage based discount billing plans (step 260).

Referring now to Fig. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The subscriber profiles are not shown, but are similar to those shown in Fig. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The AMA record is passed to a billing analysis system 312 which applies subscriber specific parameters to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Like the billing analysis system of Fig. 1b, the billing analysis system of Fig. 3 includes a SD 313. The billing analysis system of Fig. 3 also includes an integrated subscriber profile - although, it should be noted that for simplicity of presentation the individual subscriber profile databases are not shown in Fig. 3, nor in the figures that follow. Also, like the billing analysis system of Fig. 1a, the billing analysis system of Fig. 3 accumulates summary information as each individual call record is received and rated in real-time, the summary information being stored in the SD 313. As in the prior described embodiment, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

Fig. 4 shows another embodiment of a telephone system in accordance with the present invention. The subscriber profiles are not shown, but are similar to those shown in Fig. 1b. In the Figure 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a network switch 406, which generates an AMA record 410. However, in the Fig. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

It should be noted that although all three embodiments discussed

above depict a call as being initiated from a first telephone and directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices.

For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single communication device and directed to multiple communication devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed
to a different terminating device will be considered an independent call.

Although specific embodiments of the present invention have been described, it will be understood by those of skill in the art that there are other embodiments which are equivalent to the described embodiments.

Accordingly, it is to be understood that the invention is not to be limited
by the specific illustrated embodiments, but only by the scope of the appended claims.

Claim

1 A method of billing a telephone call placed by an originating subscriber to a terminating subscriber, comprising the steps of
connecting the telephone call between the originating subscriber and the terminating subscriber;
receiving a signal initiating split billing;
receiving a signal indicating a billing portion; and
billing the both the originating subscriber and the ten-ninating subscriber for at least a portion of the cost of the telephone call, based on the indicated billing portion.

2 The method of claim 1,,wherein the billing portion is specified as a percentage.
3 The method of claim 2, wherein the specified percentage is less than 100%.

4 The method of claim 2, wherein the specified billing portion equals 100%.

5 The method of claim 1, wherein the billing portion is specified as a monetary value.

6 The method of claim 1, wherein the billing portion is specified as a time period.

7 The method of claim I 1, wherein split billing is initiated by the originating subscriber.

8 The method of claim 7, wherein the terminating subscriber was responsible for the entire cost of the call prior to split billing being initiated.

9 The method of claim 1, wherein split billing is initiated by the terminating subscriber.
I 10. The method of claim 9, wherein the originating subscriber was responsible for the entire cost of the call prior to split billing being

initiated.
I IL A system for billing a telephone,call placed by an originating subscriber to a terminating subscriber, comprising the steps of
a switching device connecting the telephone call between the originating subscriber and the terminating subscriber;
a first receiver, coupled to the switching device, receiving a signal initiating split billing;
a second receiver, coupled to the switching device, receiving a signal indicating a billing portion; and
a billing device, coupled to the second receiver, billing the both the originating subscriber and the terminating subscriber for at least a I I portion of the cost of the telephone call, based on the indicated billing portion.

12 The system of claim I 1 , wherein the billing portion is specified as a percentage.

13 The system of claim 12, wherein the specified percentage is less than 100%.
i 14. A system for billing a telephone call placed by an originating subscriber to a terminating subscriber, comprising the steps of
means for connecting the telephone call between the originating subscriber and the terminating subscriber;
a means for receiving a signal initiating split billing, coupled to the connecting means;
a second means for receiving a signal indicating a billing portion, coupled to the switching device; and
means for billing both the originating subscriber and the
10 terminating subscriber, coupled to the second receiver, billing each
1 1subscriber for at least a portion of the cost of the telephone call,
based 12 on the indicated billing portion.

15 The system of claim 14, wherein the billing portion is specified as a percentage.

16 The system of claim 15, wherein the specified percentage is less than 100%.

17 The system of claim 15, wherein the specified billing portion equals 100%.

18 The system of claim 14, wherein the billing portion is specified as a monetary value.
19 The system of claim 14, wherein the billing portion is specified as a time period.
?

T S4/9/8

4/9/8 (Item 2 from file: 613)
DIALOG(R)File 613:PR Newswire

00724432 20020226PHTU031 (THIS IS THE FULLTEXT)
Schweiker Administration Expansion of Long-Term Care Services
PR Newswire
Tuesday, February 26, 2002 11:44 EST
JOURNAL CODE: PR LANGUAGE: ENGLISH RECORD TYPE: FULLTEXT
DOCUMENT TYPE: NEWSWIRE
WORD COUNT: 1,050

TEXT:
HARRISBURG, Pa., Feb. 26 /PRNewswire/ - On behalf of Pennsylvania Gov. Mark Schweiker, Aging Secretary Richard Browdie and Public Welfare Secretary Feather Houstoun today announced that the implementation of new programs to enhance long-term care services to older Pennsylvanians will help more than 11,000 senior citizens and their families.

"These new and expanded programs are gaining momentum across the state and will allow us to serve more people in their own homes and communities," Secretary Browdie said. "We will enable more Pennsylvanians than ever to exercise real choice about how and where they receive long-term care. This expansion of our system's capacity, made possible by the funds through the Tobacco Settlement, represents the largest expansion of in-home services for older persons ever in Pennsylvania, when fully implemented over the next three years."

Services range from personal care to specialized medical equipment and supplies to home modifications.

Expanded long-term care services will be made available through changes to the existing Options Program and the creation of a new "Bridge" Program. A new aspect for these programs is the introduction of **cost sharing** for some individuals. **Cost sharing** allows more people to receive community services, and is structured to require only those who can pay for services to do so.

The new Bridge Program will provide long-term care services to older Pennsylvanians in their homes who are not financially eligible for Medical Assistance. The program is available to Pennsylvanians who are age 60 and older; are found to need nursing facility services through an Area Agency on Aging (AAA) assessment; wish to remain in their own home to receive care and services; have an income of no more than $1,635 per month; and have assets under $40,000.

The program requires individuals to pay for a portion of the services they need until their resources are reduced to Medicaid eligibility -- at which point their home- and community-based services and health care will be paid for by Medicaid. When people are no longer able to pay for services and become eligible for Medicaid, they will be seamlessly transitioned to the Medicaid home- and community-based providers. It is expected that approximately 200 people per month will be found eligible for this program.

"The beauty of this program is that it gives people in need of long-term care services more options and creates a seamless bridge to Medical Assistance services when an individual becomes eligible," Secretary Houstoun said. "It continues Pennsylvania's commitment to providing services in the location consumers most prefer -- in their own homes and communities."

Beyond the creation of the new Bridge Program, Tobacco Settlement funds also are being used to expand Medical Assistance community-based services for people age 60 or older.

Home- and community-based services, funded through the Pennsylvania Lottery, will be enhanced through a one-time investment of $10 million in

tobacco funding and the implementation of a statewide**cost** -□sharing□ program.
Consumers whose income exceeds 125 percent of poverty (currently $895 a month
after allowable deductions), will be asked to**share**in the cost of several
long-term care services on an income-related sliding scale. Proceeds from the
co-payments will go directly back into a pool of funds to enable the AAAs to
continue to deliver in-home services to needy seniors as caseloads rise.

"Under the current lottery-funded Options Program, many older Pennsylvanians in need of home- and community-based services are forced to be
placed on waiting lists due to funding constraints," Secretary Browdie said.
"Seniors and aging service professionals have been recommending a standardized
statewide**cost** -□sharing□system for a number of years. Half the Area Agencies
on Aging in the state had their own systems."

Secretary Houstoun said, "Through the use of consumer**cost** -□sharing□ , those
who can will be asked to contribute a small portion of the cost of the
services they receive, and everyone across the state will be treated the same.
As a result, many more Pennsylvanians will be able to benefit from the
long-term care services offered to those in need.

"All people in need of long-term care deserve the opportunity to receive
these much-needed services in their homes at a fair cost. This is a big step
in making that possible to people of all incomes."

Pennsylvanians participating in the programs will receive care-management
services from their Area Agency on Aging. The AAAs, together with the
consumer, will develop a customized care and service plan that will identify
the needs of the recipient, what services will be provided to meet those
needs, and who will provide those services. The consumer will choose their
service providers.

By the end of 2002, the departments of Aging and Public Welfare expect to
serve an additional 11,000 seniors who are in need of long-term care services,
but who wish to remain at home or in their community.

In January, Gov. Schweiker launched a new statewide advertising campaign
designed to help Pennsylvanians learn more about long-term care options for
senior citizens and people with disabilities.

The campaign encourages Pennsylvanians to visit a new long-term care
website at www.state.pa.us, PA Keyword: "Long Term Care" -- and**call**a
toll -free helpline at 1-866-286-3636, which offer options, advice and
answers.

The new website and toll-free helpline provide credible resources for
consumers -- older Pennsylvanians, younger adults with disabilities, adults
who have aging parents -- as well as professionals who counsel families in
need of long-term care.

The website includes information on the available service options,
including home care, public and private financing of those options, and

other
issues.

Helpline operators will provide individualized help in identifying long-term care resources and options available in a person's community and will provide local referrals to callers.

For more information or for a free assessment, contact your local Area Agency on Aging or visit the PA PowerPort www.state.pa.us, PA Keyword: "Aging."

CONTACT: Larissa B. Johnson of PA Dept. of Aging, +1-717-783-1549; or Jay Pagni of PA Dept. of Welfare, +1-717-787-4592.

SOURCE Pennsylvania Department of Aging
CONTACT: Larissa B. Johnson of PA Dept. of Aging, +1-717-783-1549; or Jay Pagni of PA Dept. of Welfare, +1-717-787-4592
Web site: http://www.state.pa.us

COMPANY NAMES: Pennsylvania Department of Aging; Pennsylvania Department of Public
GEOGRAPHIC NAMES: AMERICAS; NORTH AMERICA; PENNSYLVANIA; USA
INDUSTRY NAMES: JOINT VENTURES; CORPORATE; MARKETING; NEW PRODUCT DEVELOPMENT; TOBACCO; MEDICAL AND HEALTH; HEALTH CARE SERVICES; ADVERTISING AND PROMOTION; SENIOR CITIZENS; SOCIAL ISSUES
EVENT NAMES: COMPANY PROFILES; JOINT VENTURES; PRODUCT LAUNCHES; NEW PRODUCT DEVELOPMENT; ADVERTISING AND PROMOTION; SERVICES; SOCIAL ISSUES; STOCKS AND SHARES
?